

THE FAR EASTERN REVIEW

ENGINEERING FINANCE COMMERCE

MR. T. V. SOONG'S
BUDGET PLAN

THE CONSORTIUM'S ATTITUDE
TOWARDS CHINA

CHINA'S RAILWAY RE-
HABILITATION

SINO-JAPANESE AMITY

THE REHABILITATION OF
THE YELLOW RIVER BRIDGE

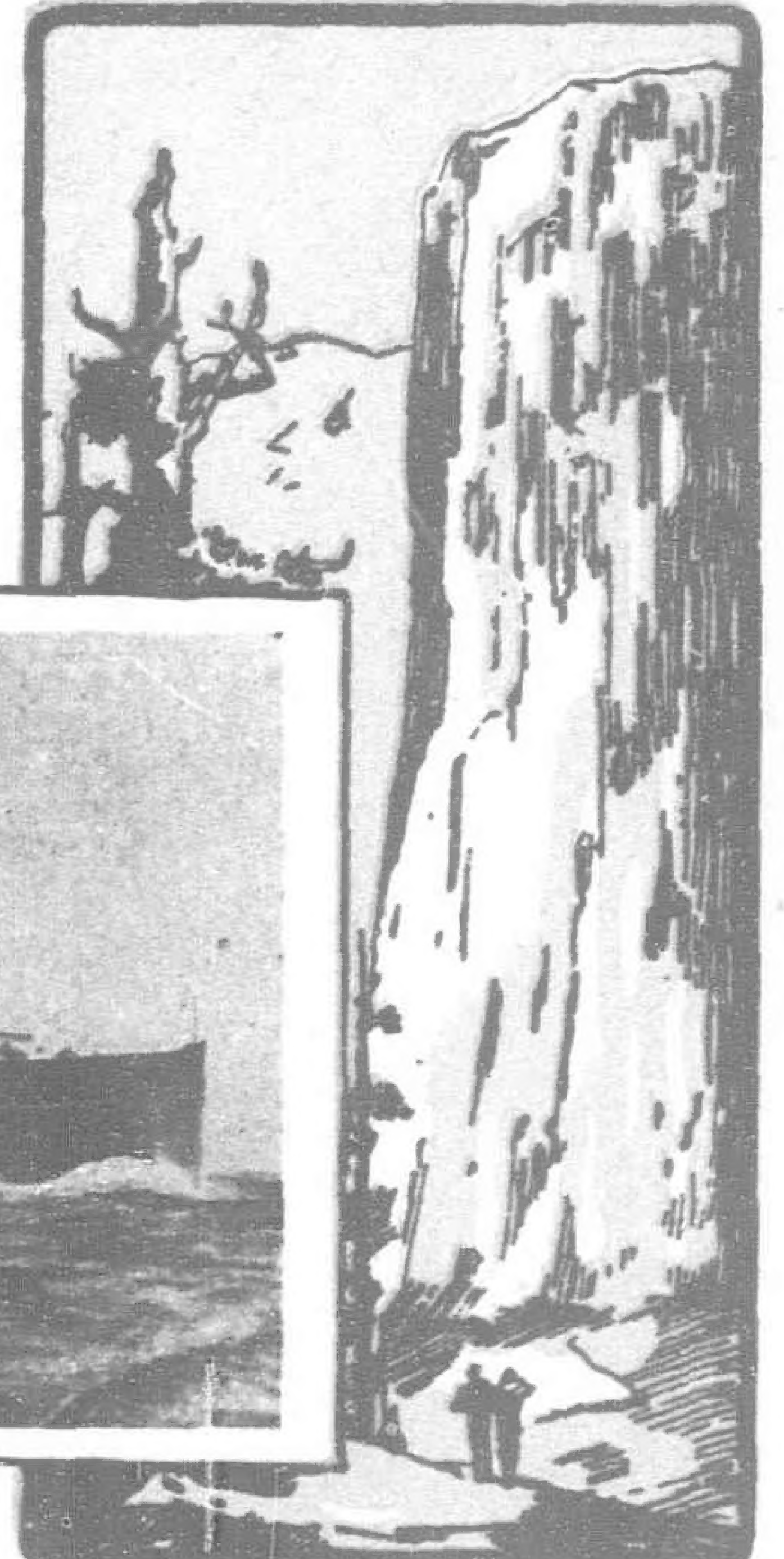
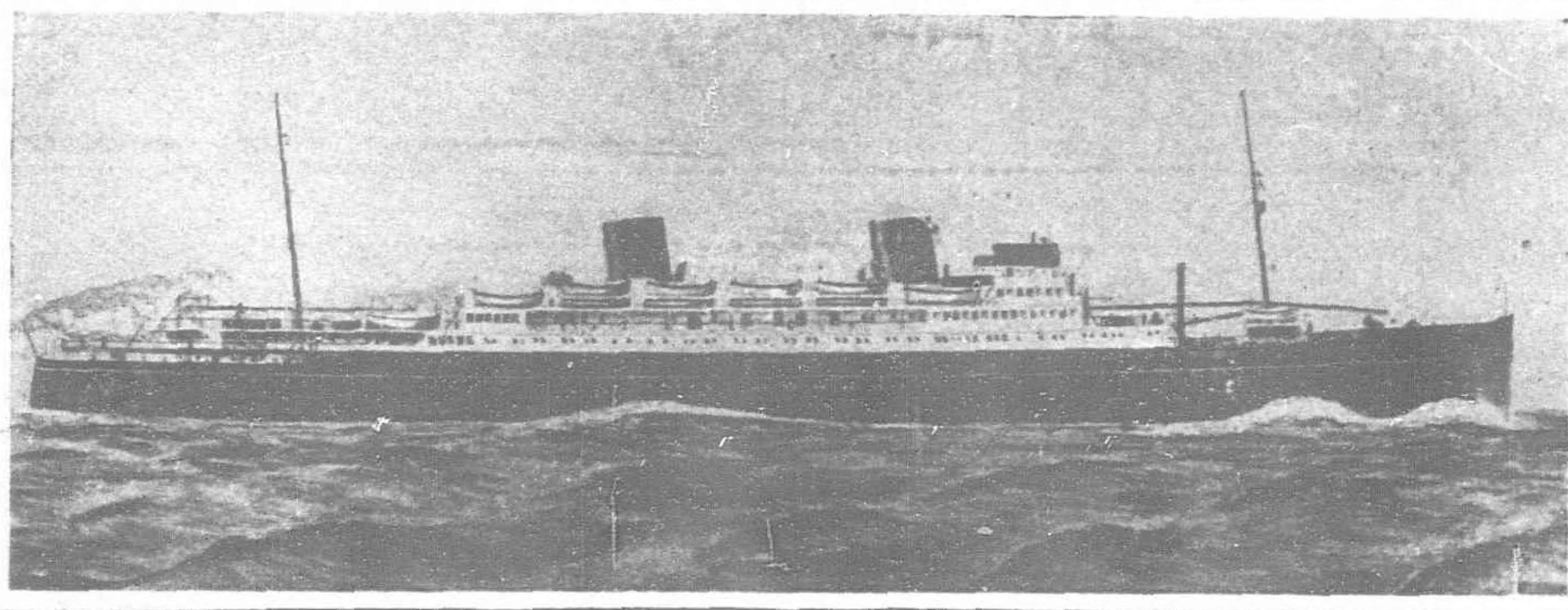
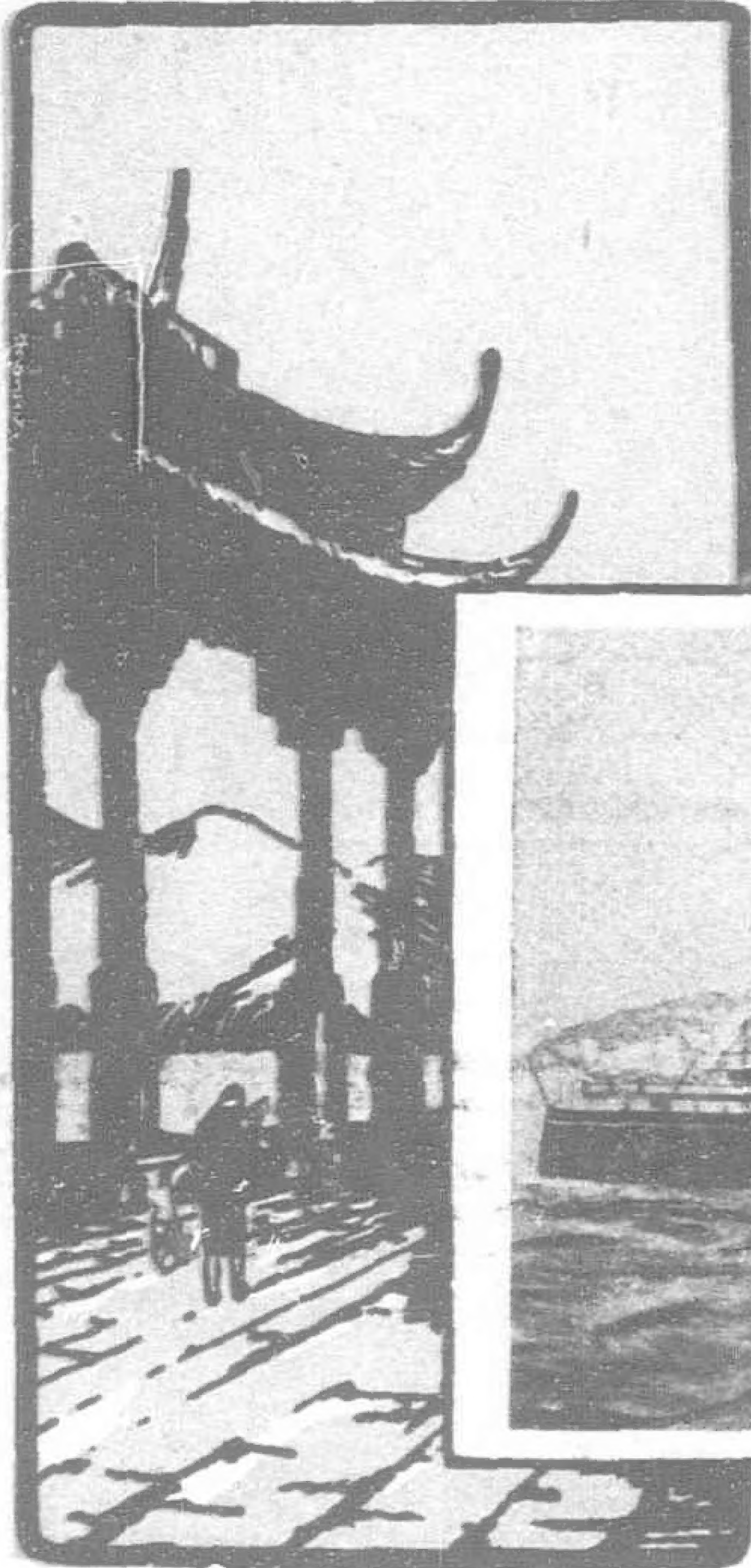
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Vol. XXV January, 1929 No. 1

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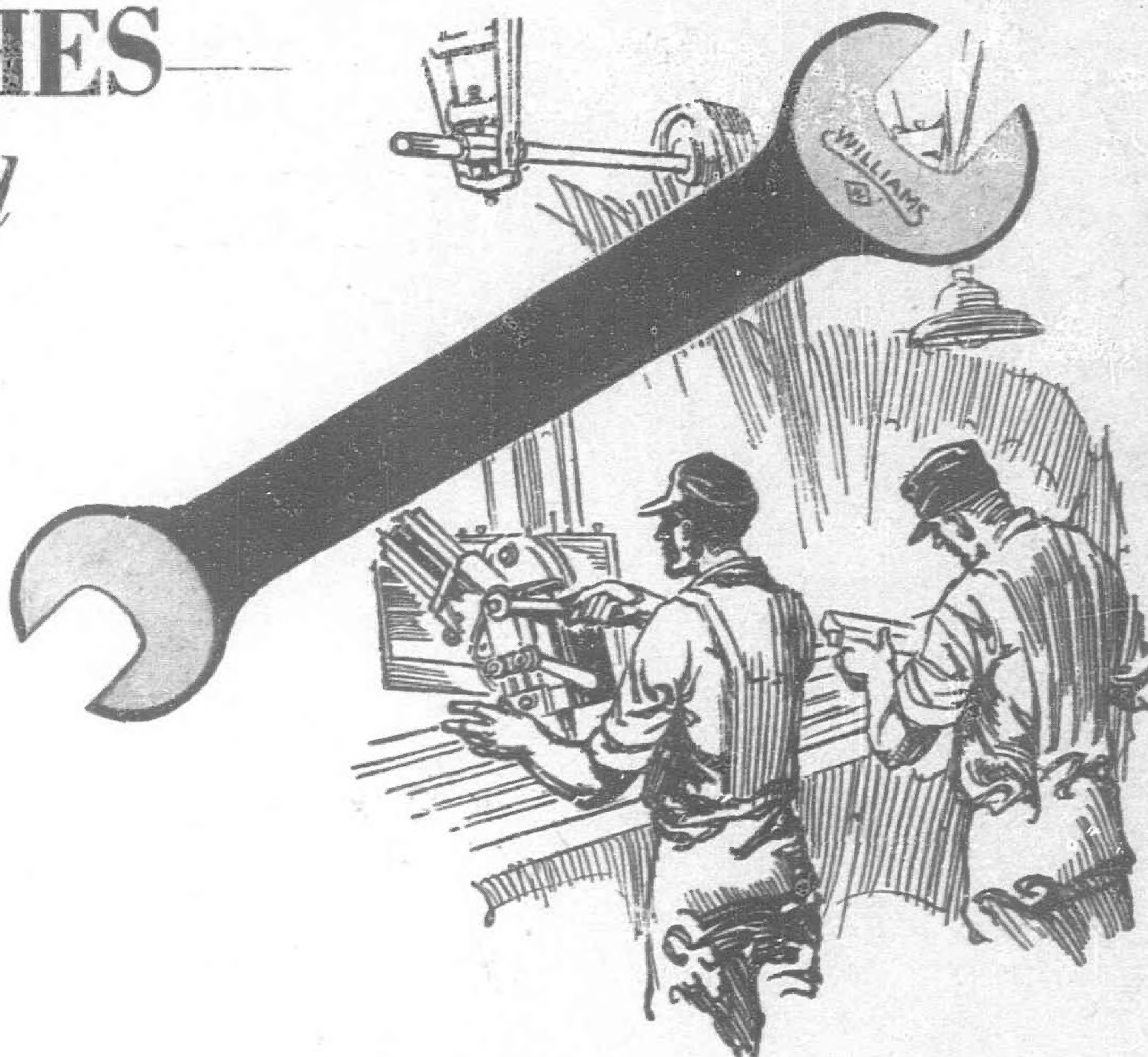
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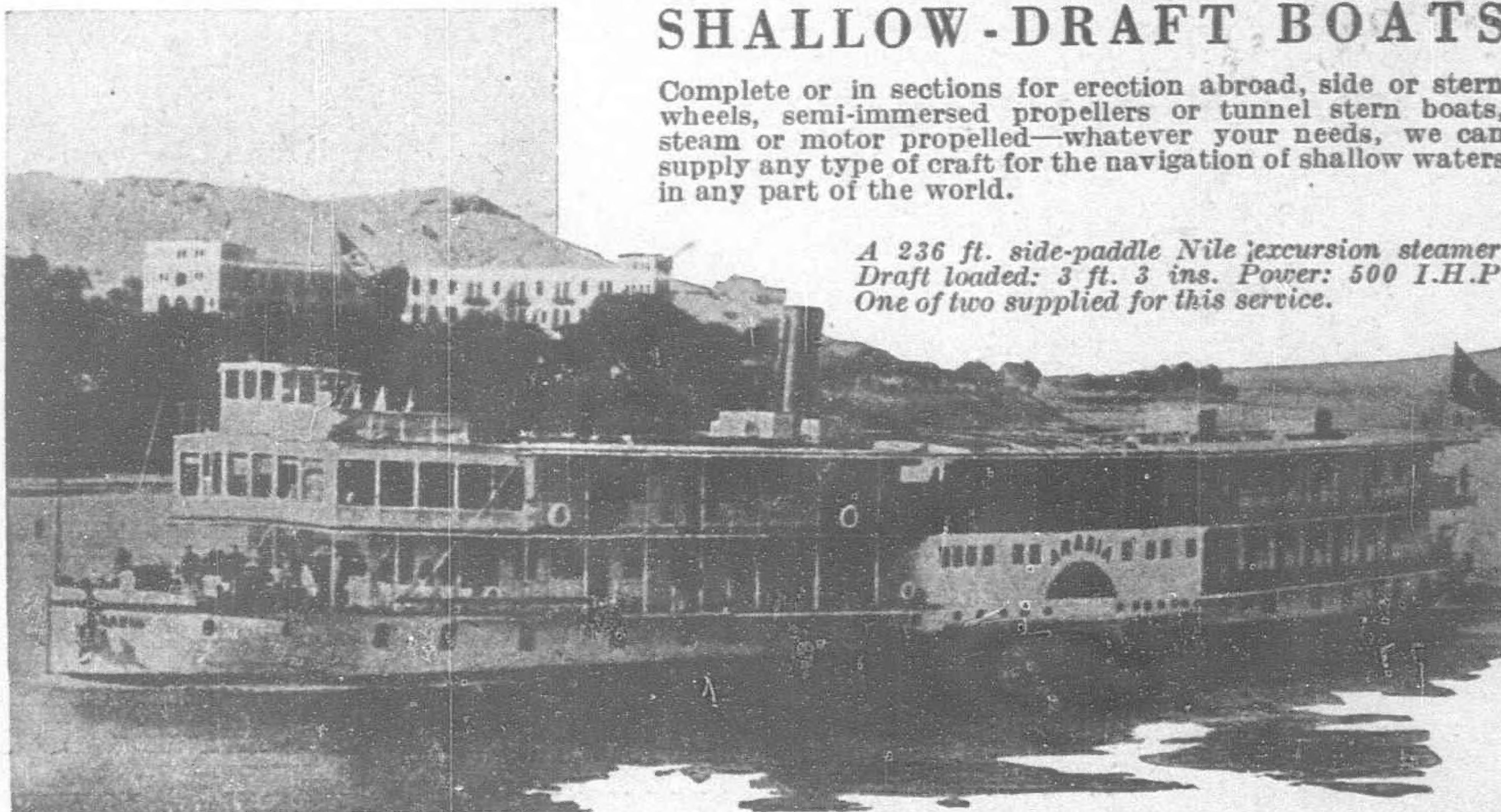
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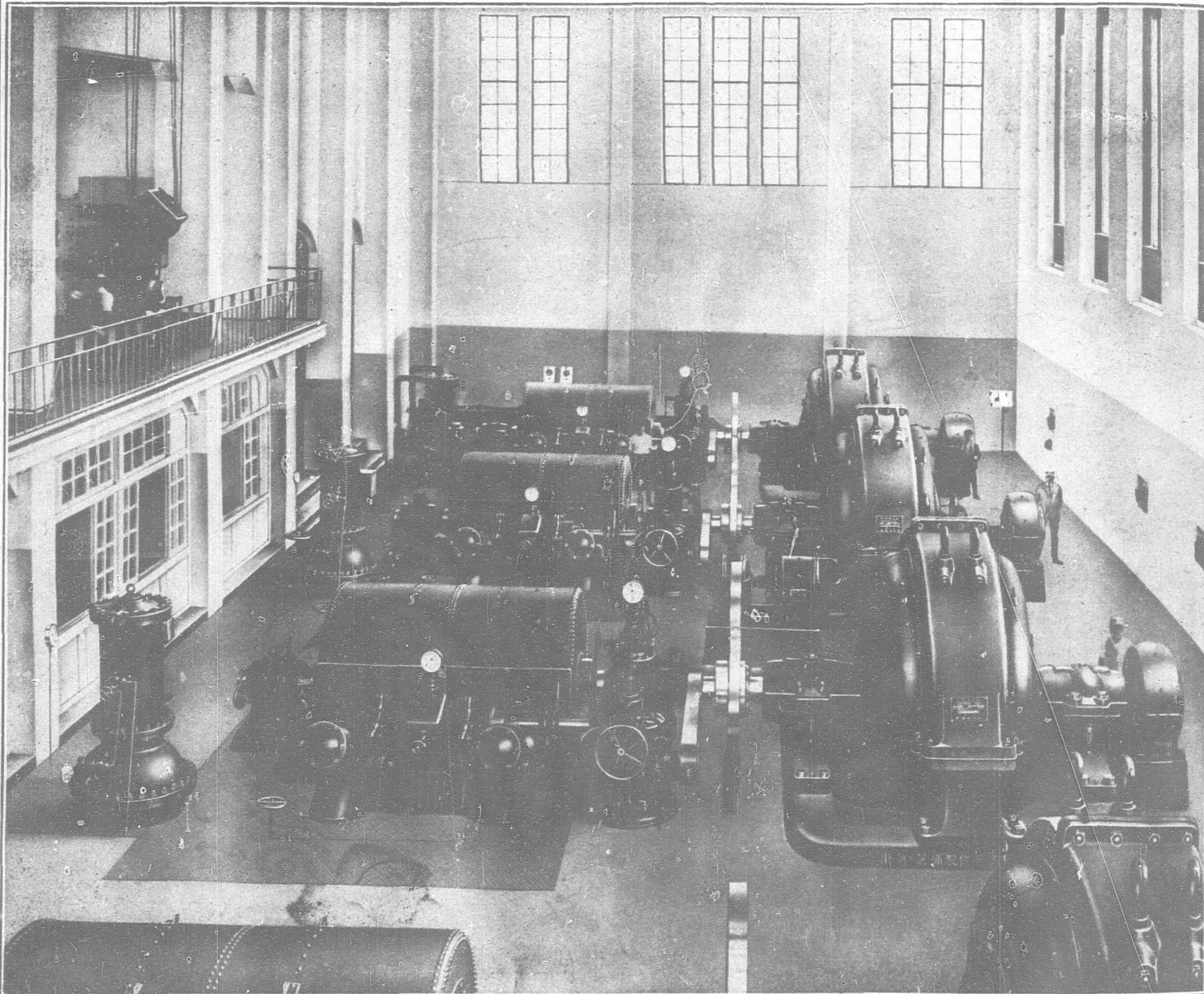
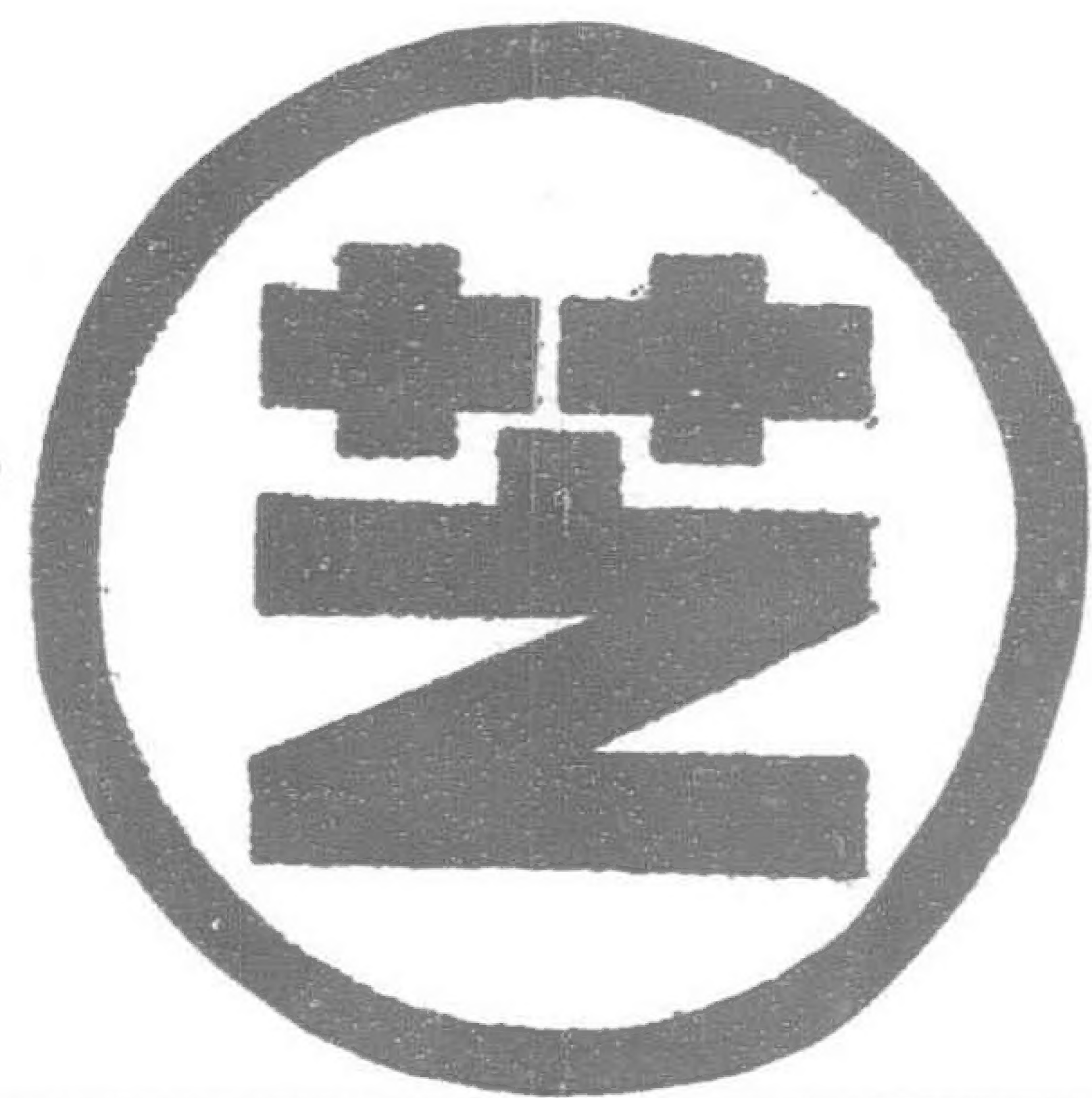


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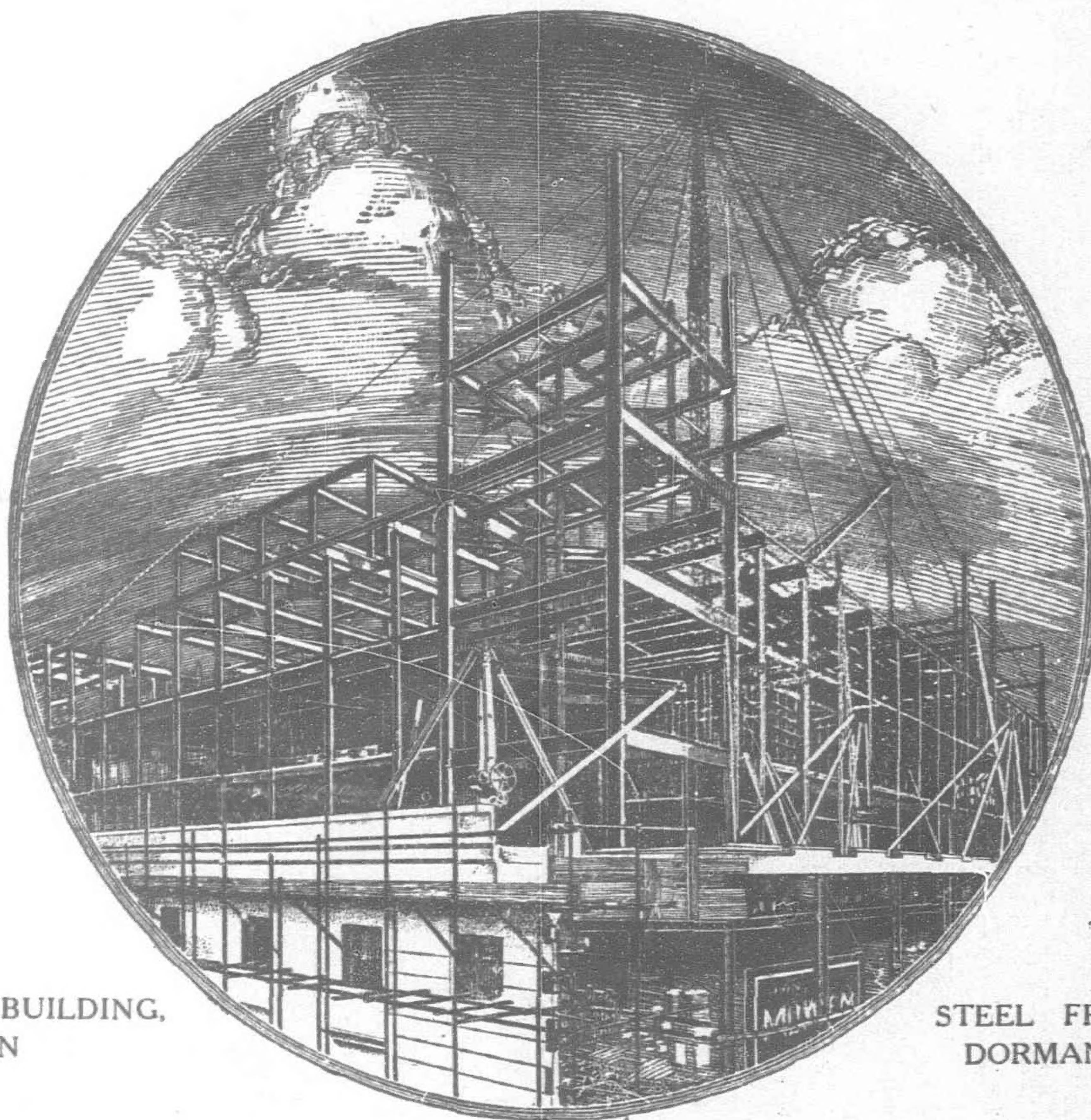
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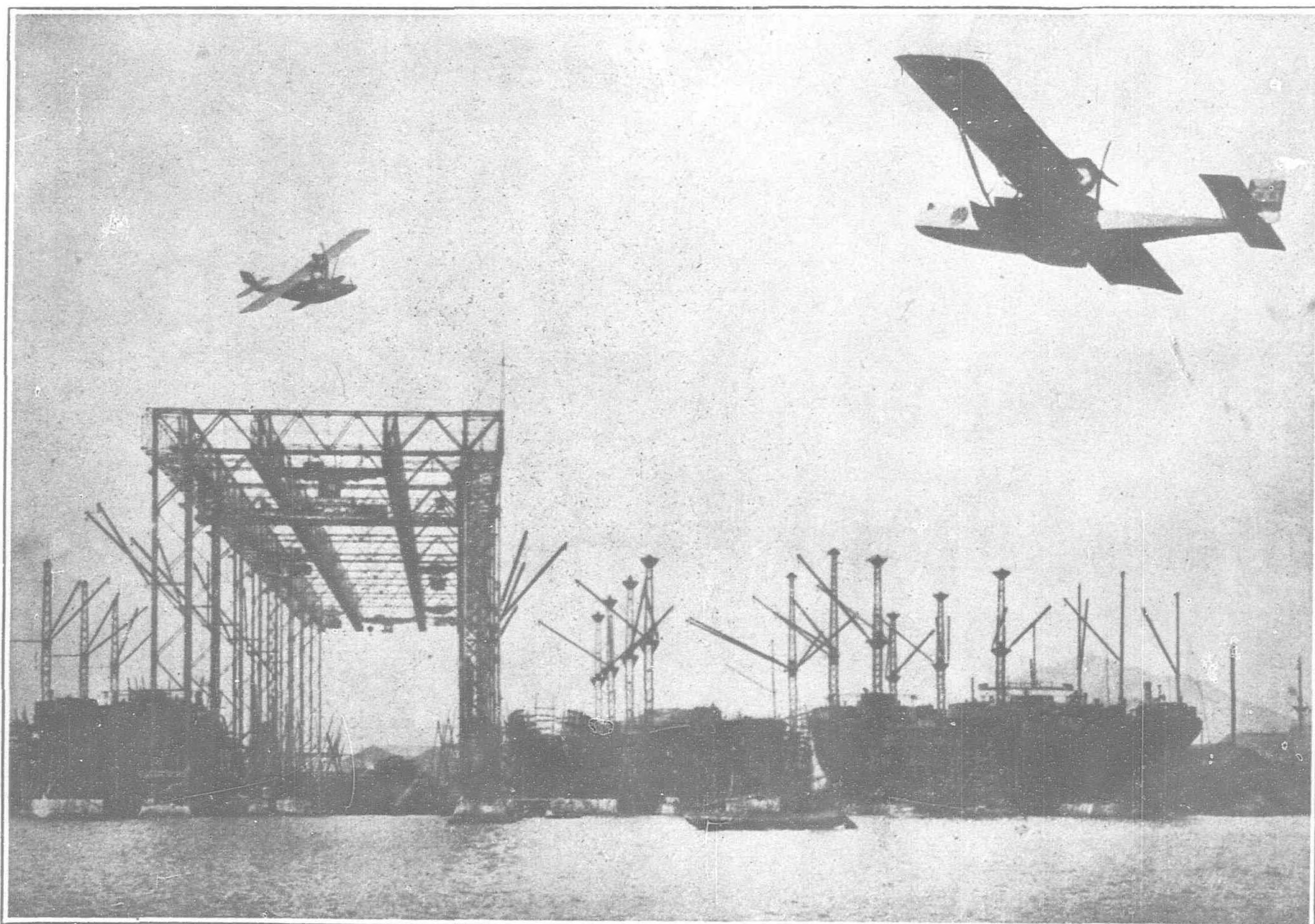
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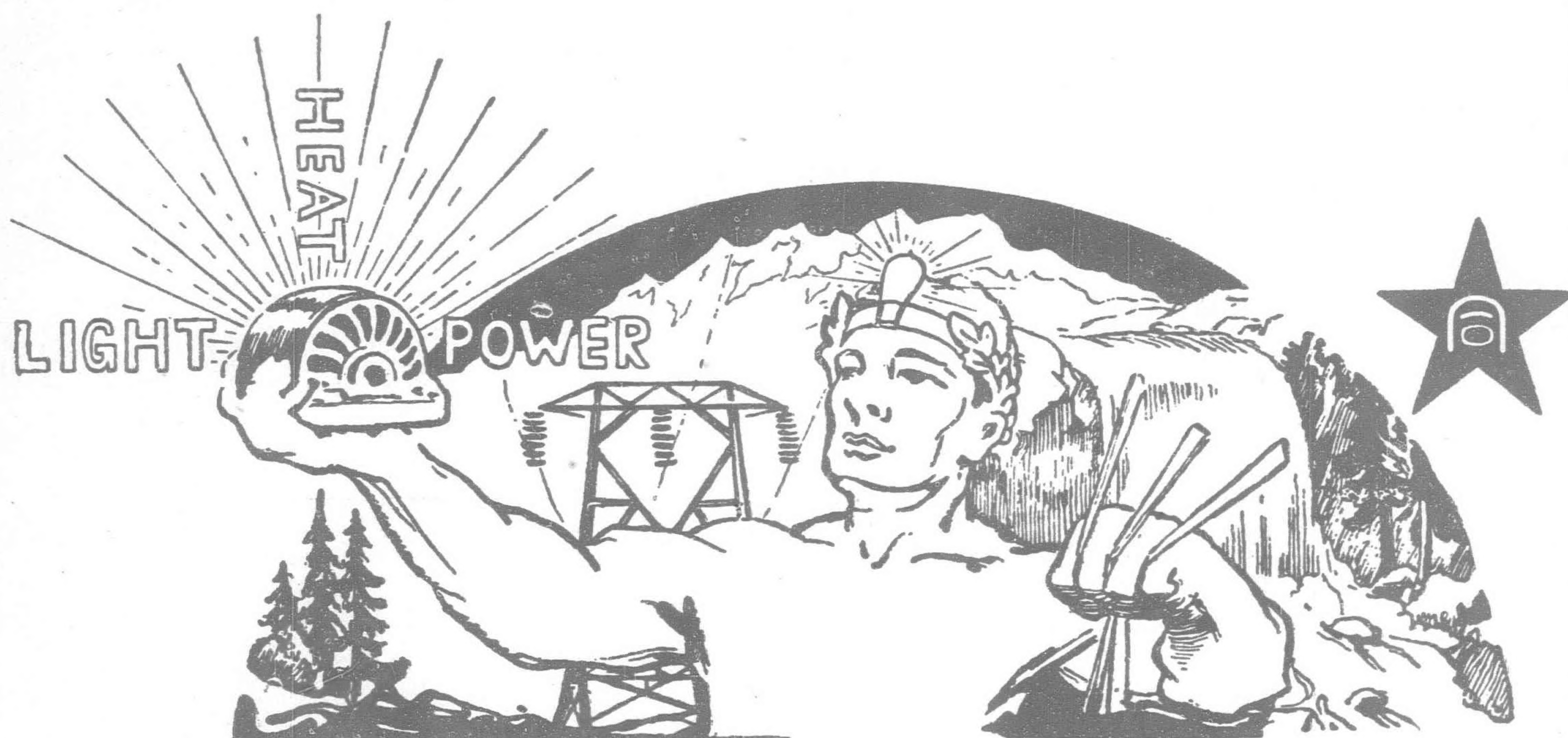
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" Suhara " " ...	9,200
" Momoyama " " ...	23,100
Yahagigawa Kushihara Power Station ...	6,000
Kuzuryugawa Nishi Kadohara Power Station ...	7,200
Total (Kilowatt) ...	154,800

Steam Power Generated by Daido

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Kema Power Station ...	12,500
Ajikawa East Power Station ...	18,000
Kasugade No. 1 Power Station ...	30,000
Kasugade No. 2 " " ...	40,000
Total (Kilowatt) ...	100,500

Power Received from Other Sources

	Kilowatt
Bisan Electric Power—Asahi Station.	1,300
Bisan Electric Power—Tokise Station	6,000
Kisogawa Denryoku—First and Second Station ...	2,700
Chuo Electric—Otani Station ...	6,000
Kamioka Water Power—Atotsugawa First Station ...	7,200
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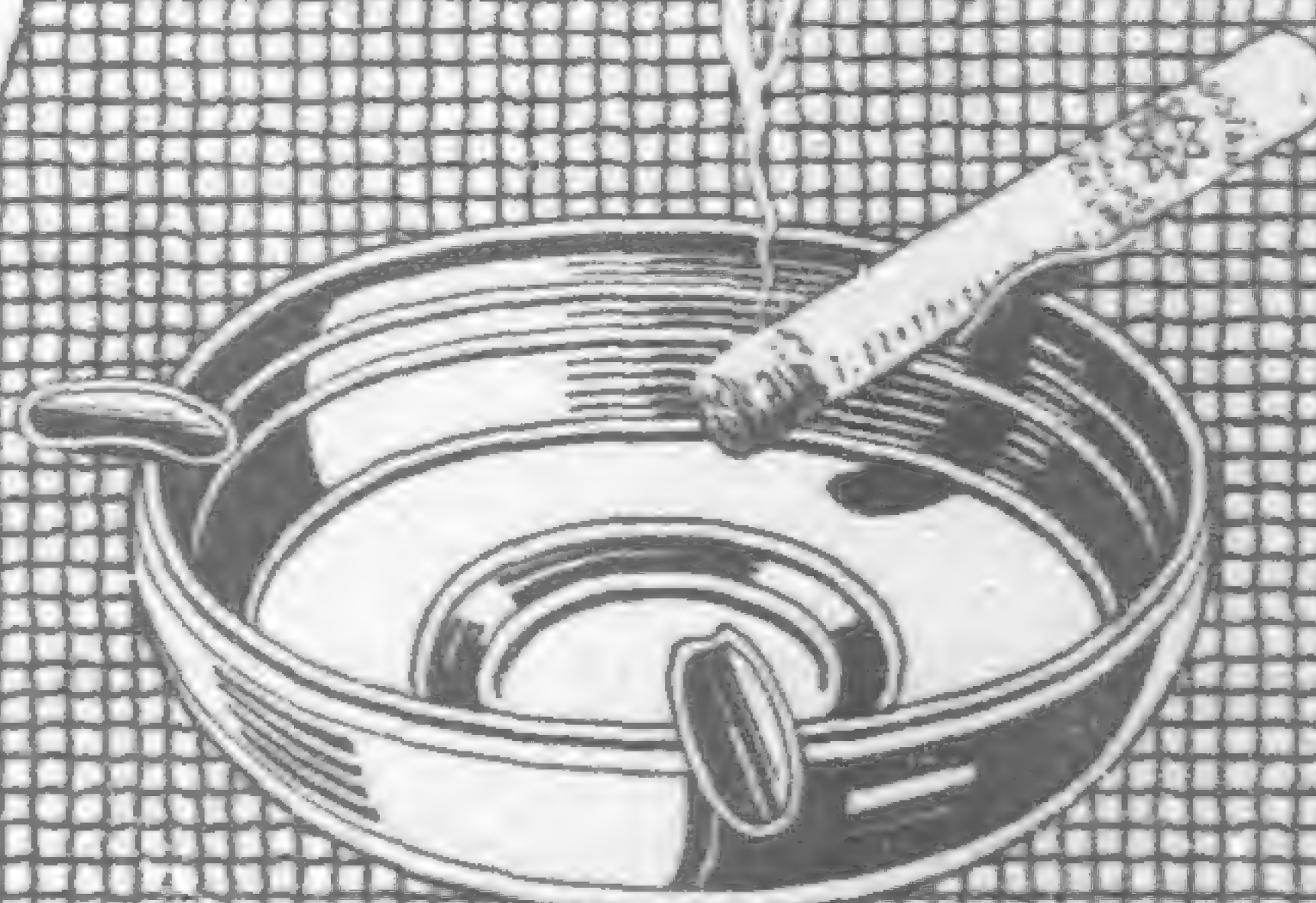
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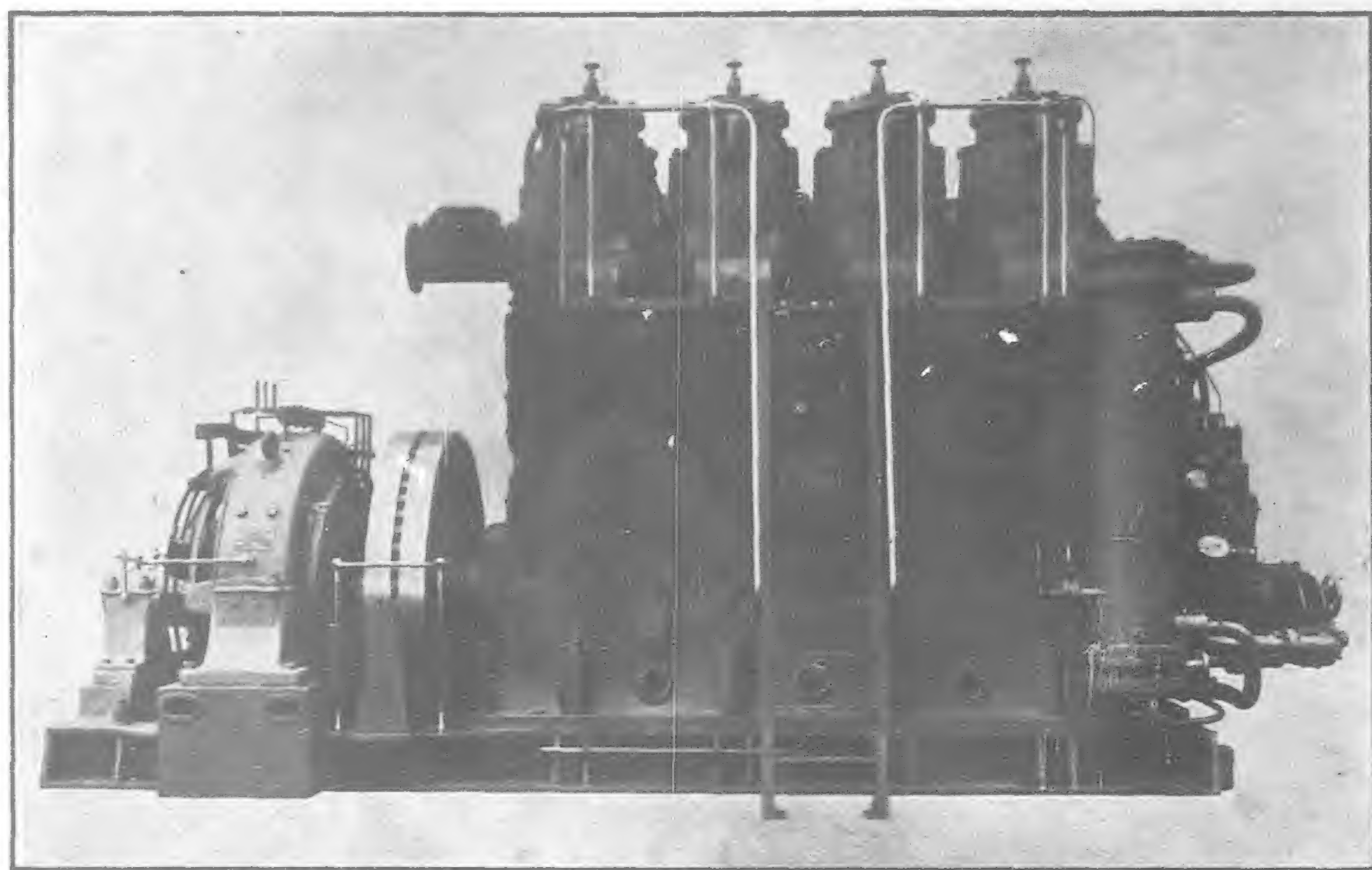
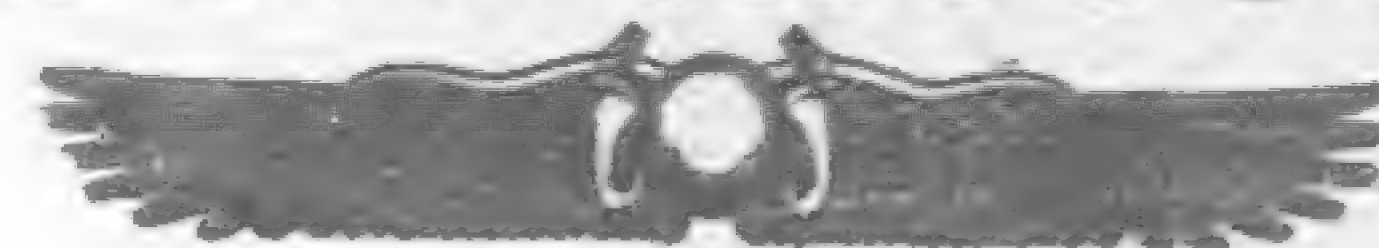
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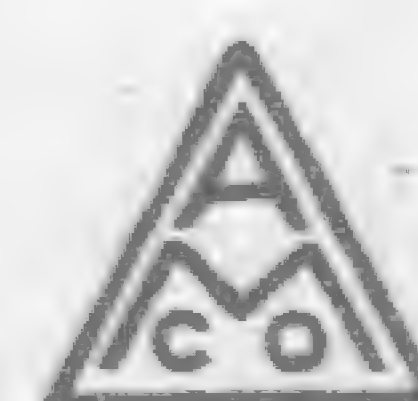
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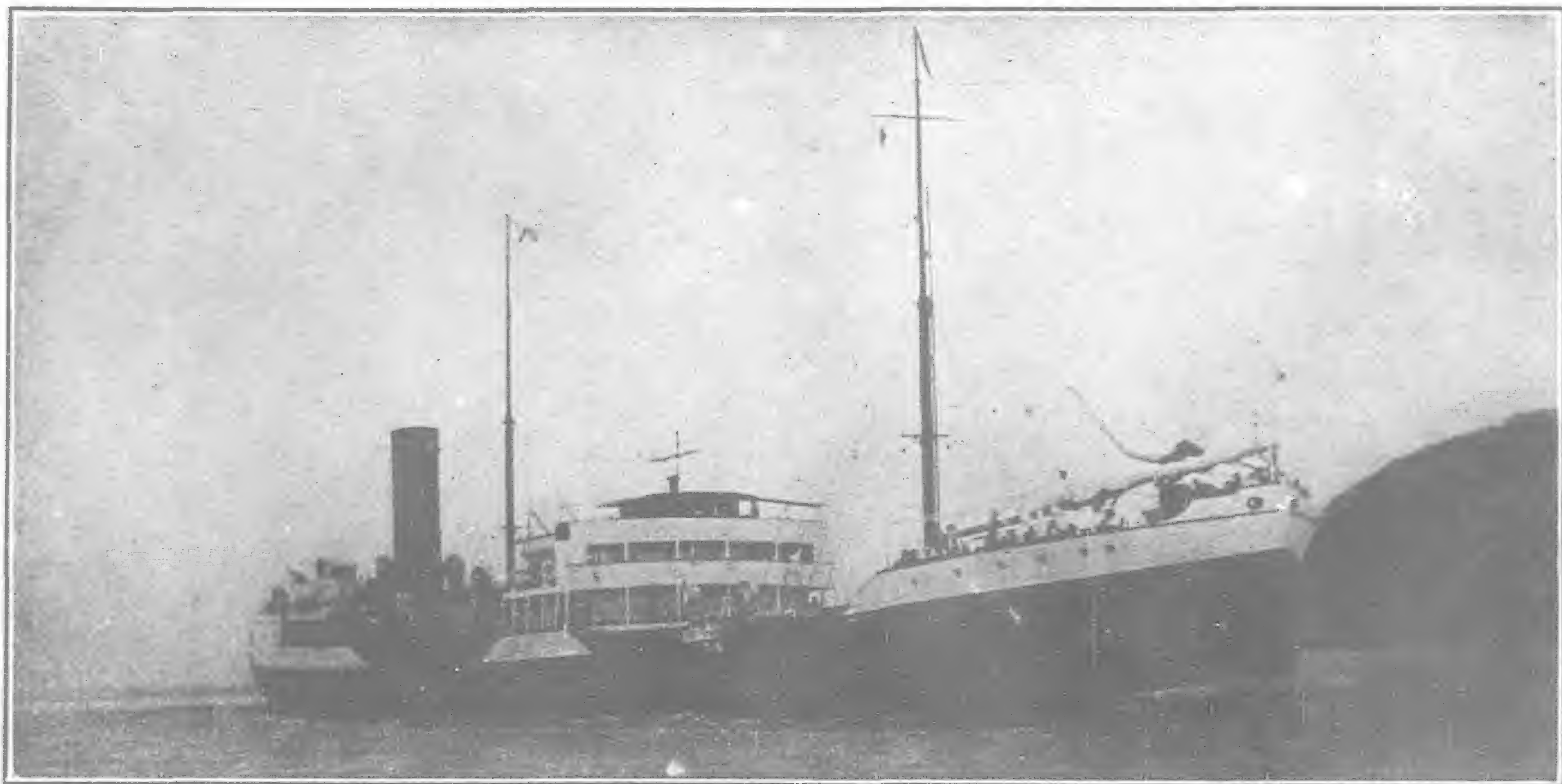
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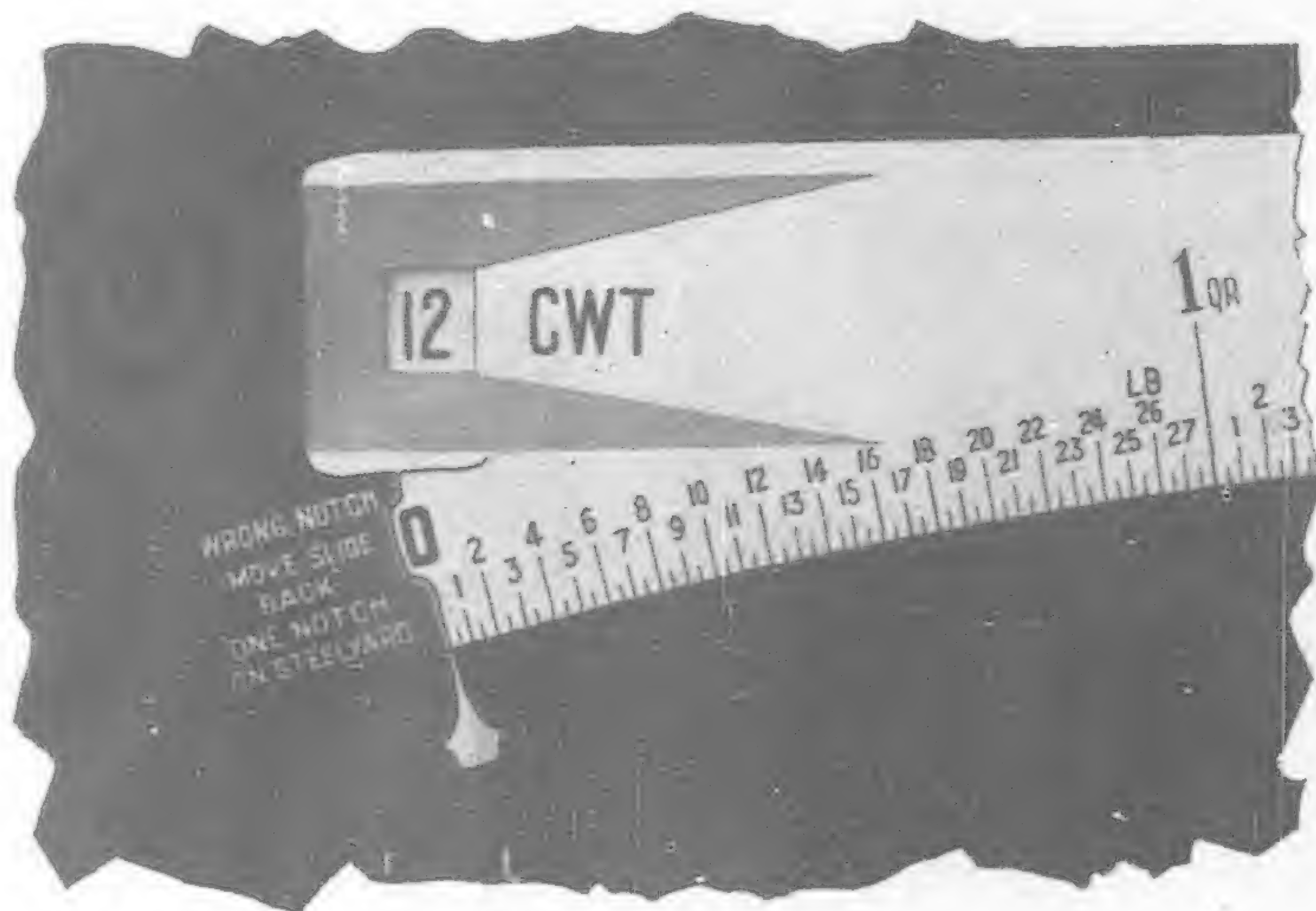
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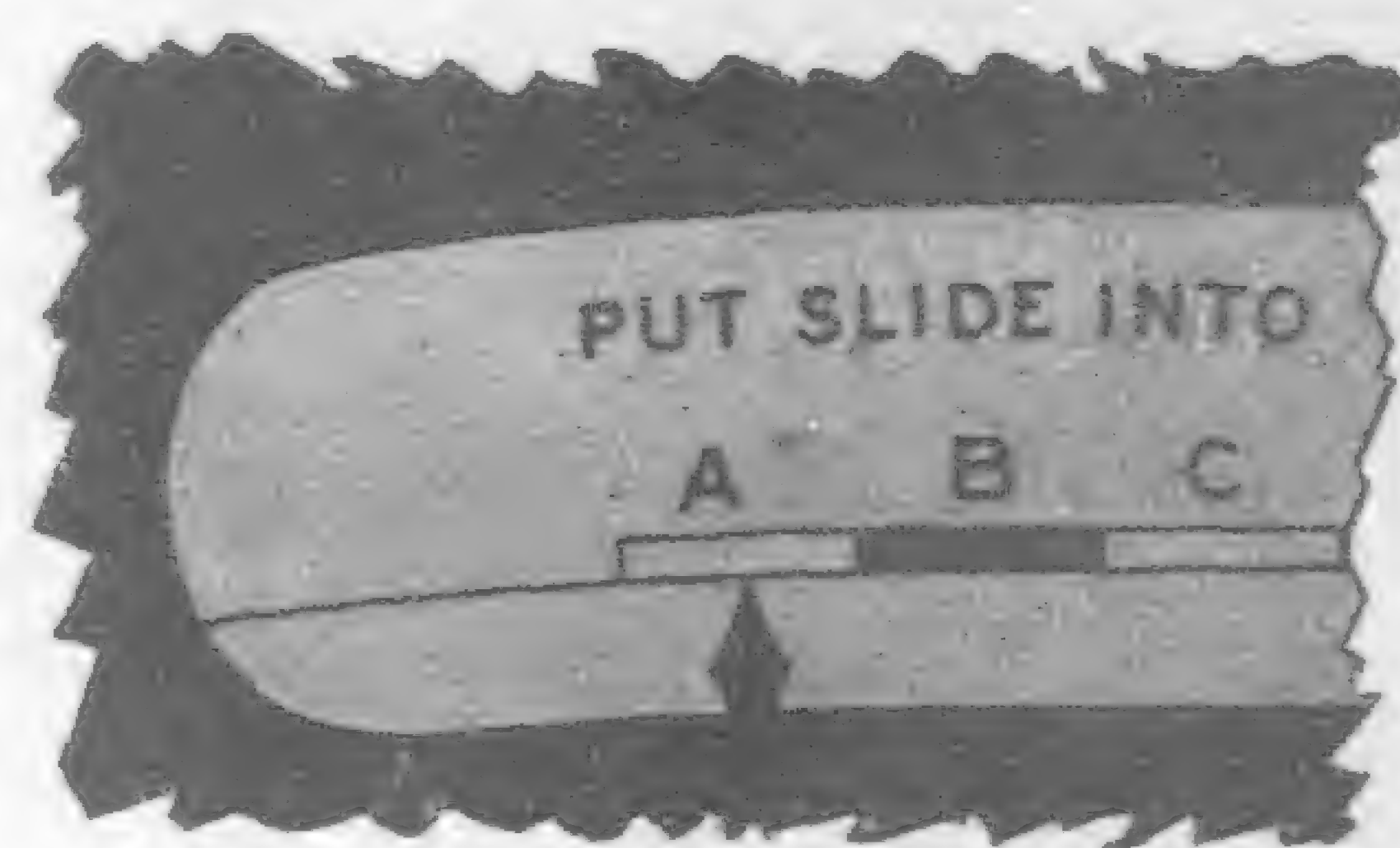
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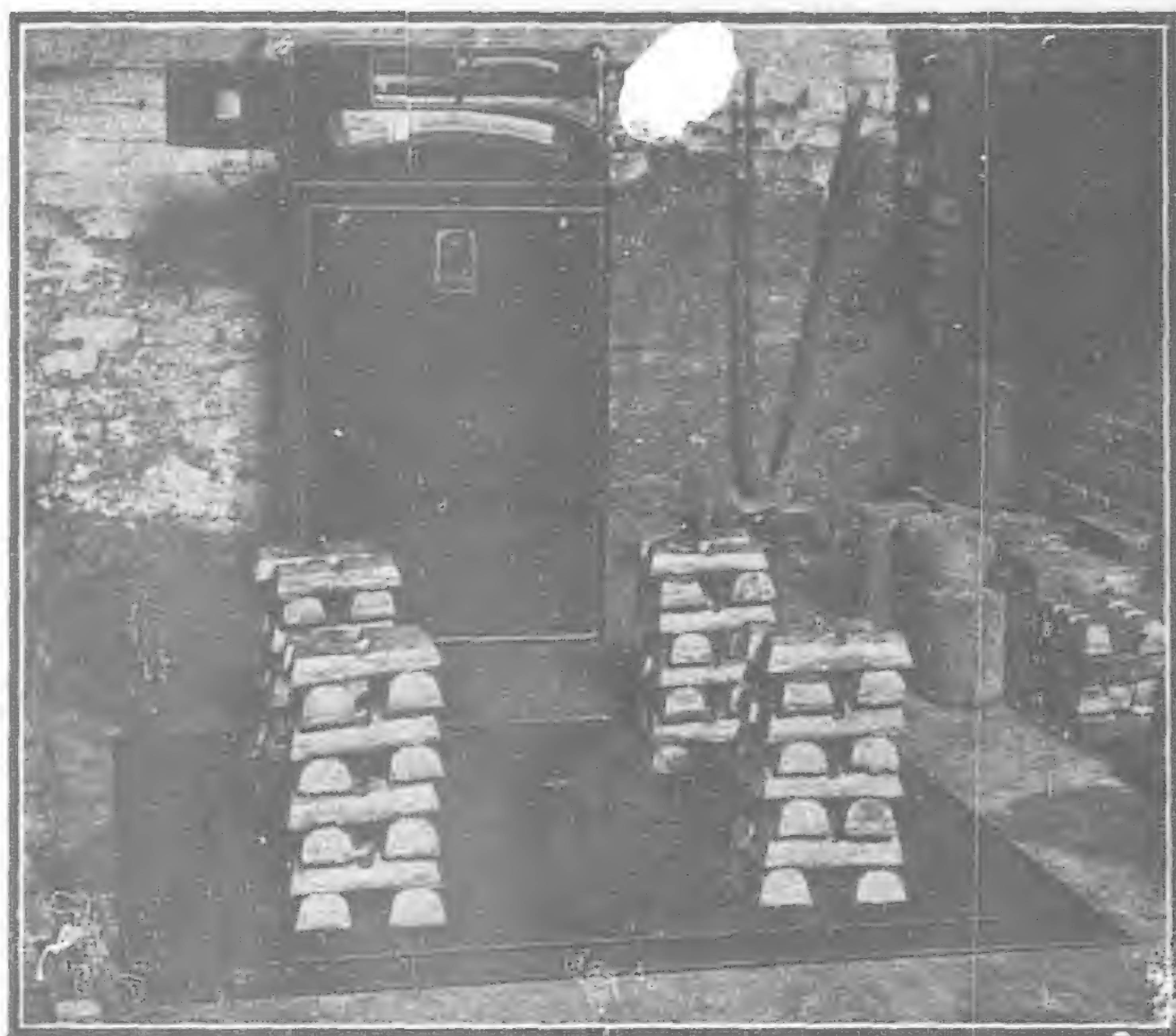
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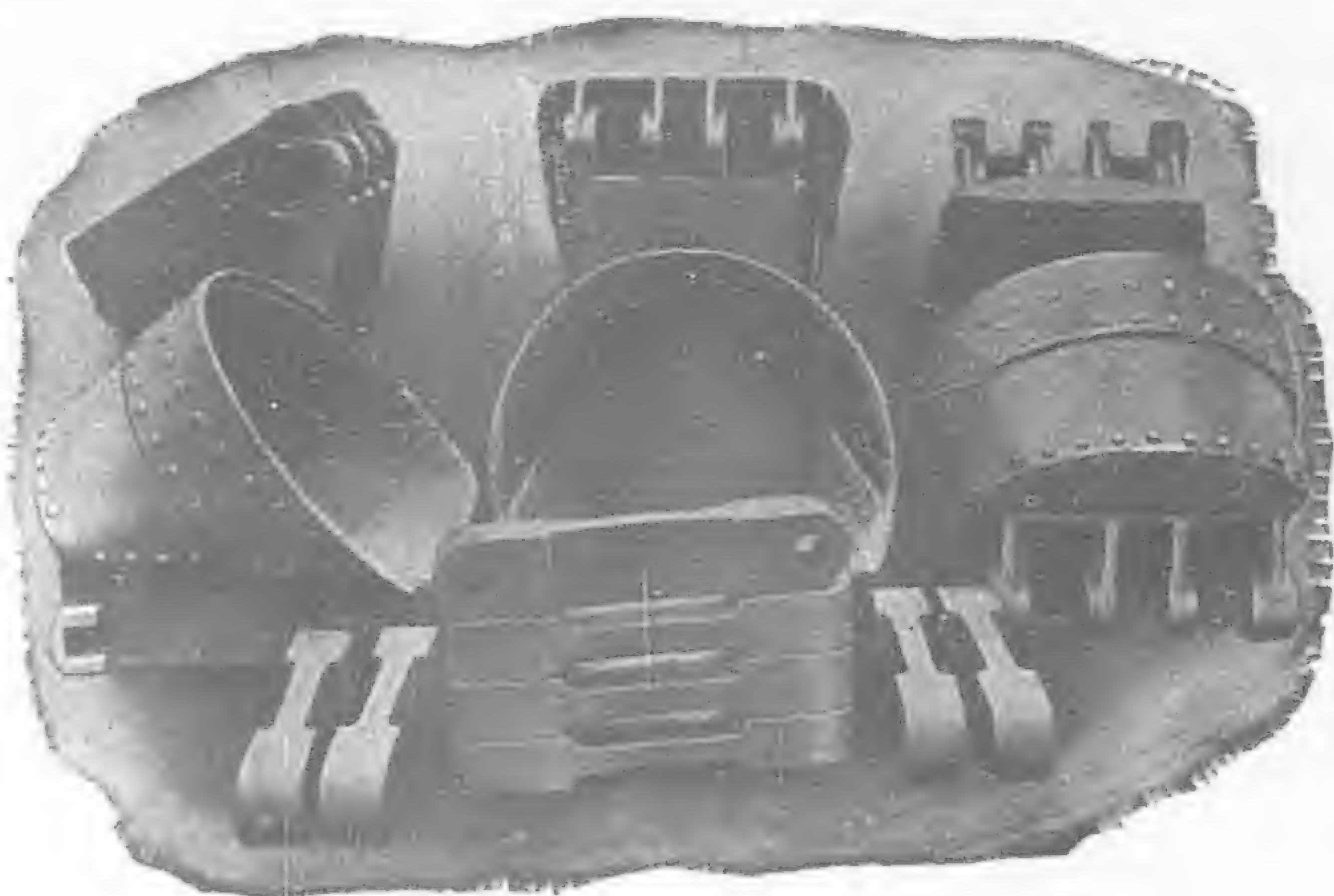
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ELECTRIC LIGHTING SETS, MOTORS
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EXPERT STAFF IN SHANGHAI.

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AND CORN MILLING MACHINERY, ELECTRIC LIGHT AND
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“IMPERIAL” Manganese Steel

“Imperial” Manganese Steel, whether used for the lips of dredger buckets, the bucket chain links, pins or bushes, means fewer stoppages due to breakage or rapid wear. As an example, the following extract from a letter may be quoted: “Up to the time I left West Africa the three bucket dredgers (gold dredging)

did not break a pin

One dredge has been at work nearly two years, and the other two six months. I think the wear of the pins constitutes a record.” What would a record like that mean to you in money saved?

The Makers of “Imperial” Manganese Steel
are

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CORPORATION, LTD.

Incorporated under the Companies
Ordinances of Hongkong

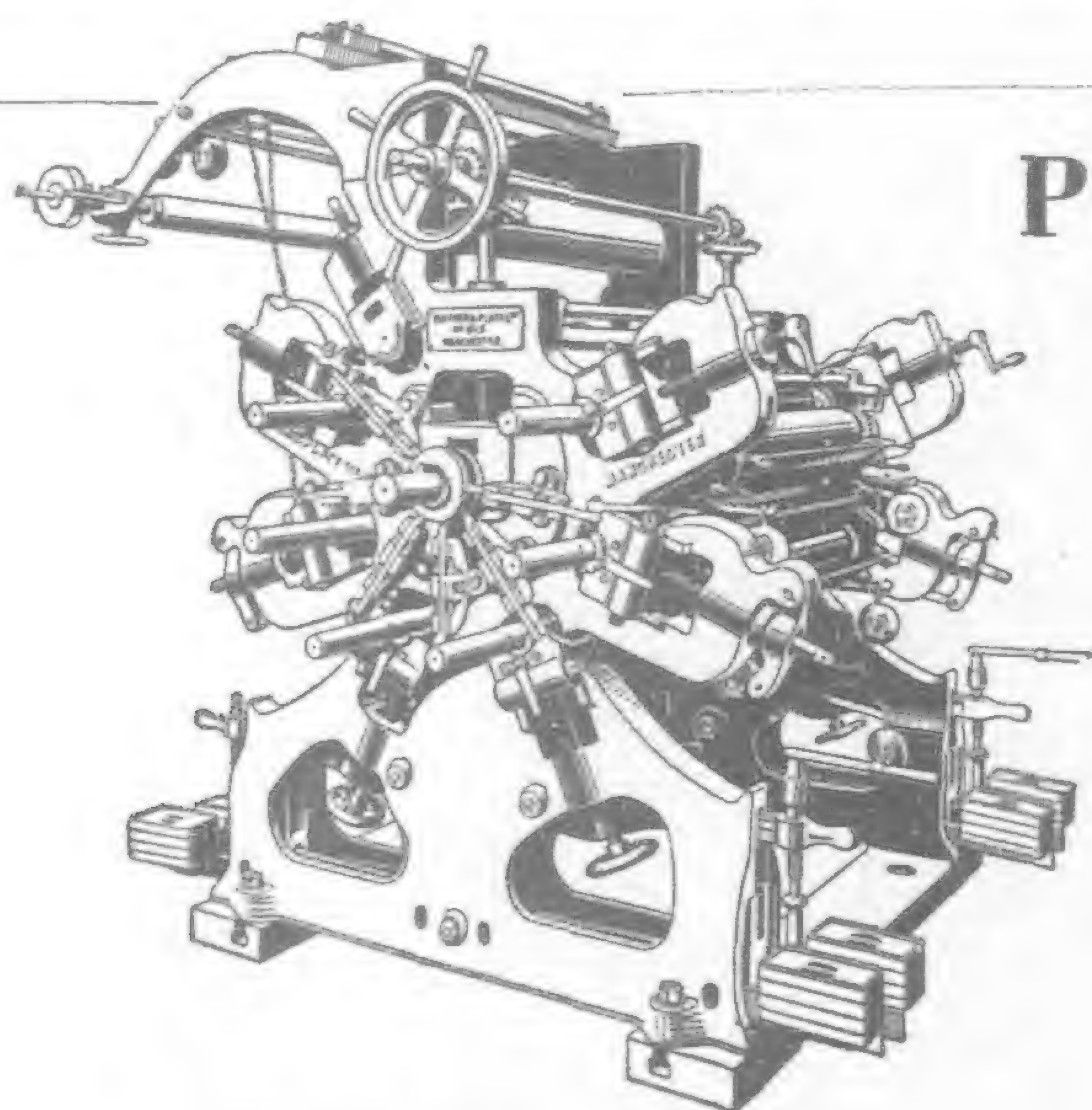
8a Yuen-Ming-Yuen Road, Shanghai
and at
Hongkong, Hankow, Tientsin, Peking, Etc.

Edgar Allen
& Co., Ltd.
Imperial Steel Works
Sheffield

JAPAN

Harada & Co., Itachibori-Kitadori,
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And Also—15 Ginza 2-Chome. Tokyo



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Six-Color Garment
PRINTING MACHINE

Agents in China: LIDDELL BROS. & CO., LTD.
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Representative: Mr. F. Fletcher, Postal Box 350,
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IN this department our manufactures include a full range of machines printing from one to fourteen colours; duplex machines for printing both sides of the cloth simultaneously are also made, up to the largest sizes.

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We have unique designs of machines for printing Sarrees and for Sample Printing, etc. Our Patent Rubber Bowls and Suction Scrapers may be fitted; these entirely dispense with the use of blankets and washing machines.

In addition to the Printing Machines themselves, we make every requisite for the Complete Equipment of Print Works. Our Representative will be pleased to give you fullest information.

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Ltd

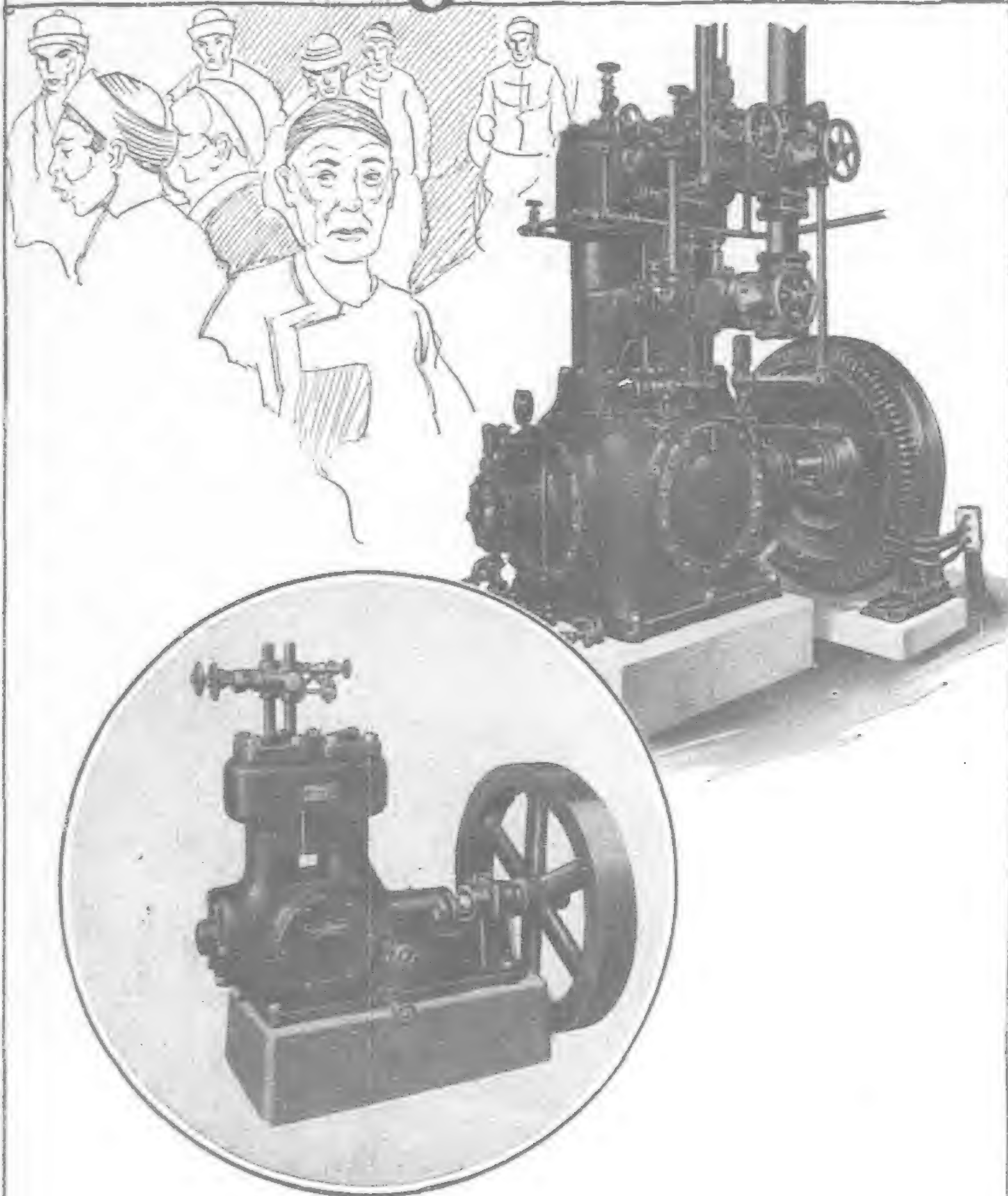
(INCORPORATED IN ENGLAND)

For 100 years—Makers of Textile Machinery

PARK WORKS, MANCHESTER — and at

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Modern methods have placed *Refrigeration* in the same group with *Heat and Power*, as an essential factor in a hundred varying lines of business. The productive, profit-producing power of mechanical refrigeration is contributing to success wherever controlled *cold* can be utilized for the preservation of perishables, in manufacturing processes, in augmenting comfort, and the convenience of present-day patronage.

The dependability and the operating advantages of York mechanical refrigeration are the result of over forty years of experience and pioneering research by the world's foremost and largest producer of commercial and industrial refrigerating machinery. Every country on the globe numbers users of York plants. To every business or industrial requirement, York brings specialized skill in applying the correct type of machine to meet every condition.

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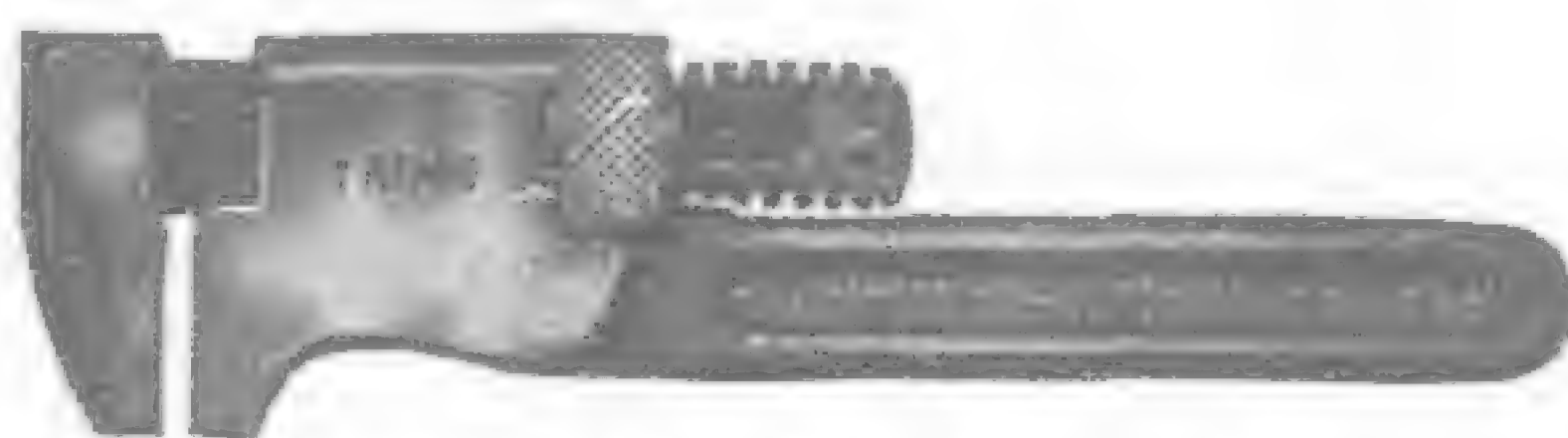
TRIMO TOOLS



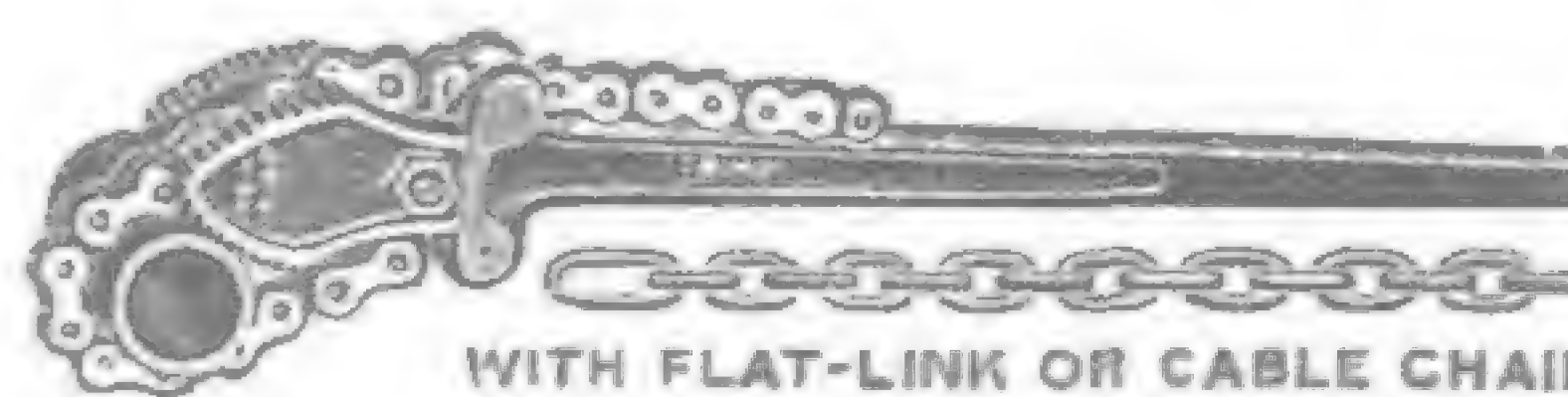
Trimo Pipe Wrench
in 8 sizes take pipe up to 8 inches



Trimo Pipe Cutter
in 3 sizes cut pipe up to 3 inches



Trimo Monkey Wrench
made in 7 sizes—6-in. to 21-in.



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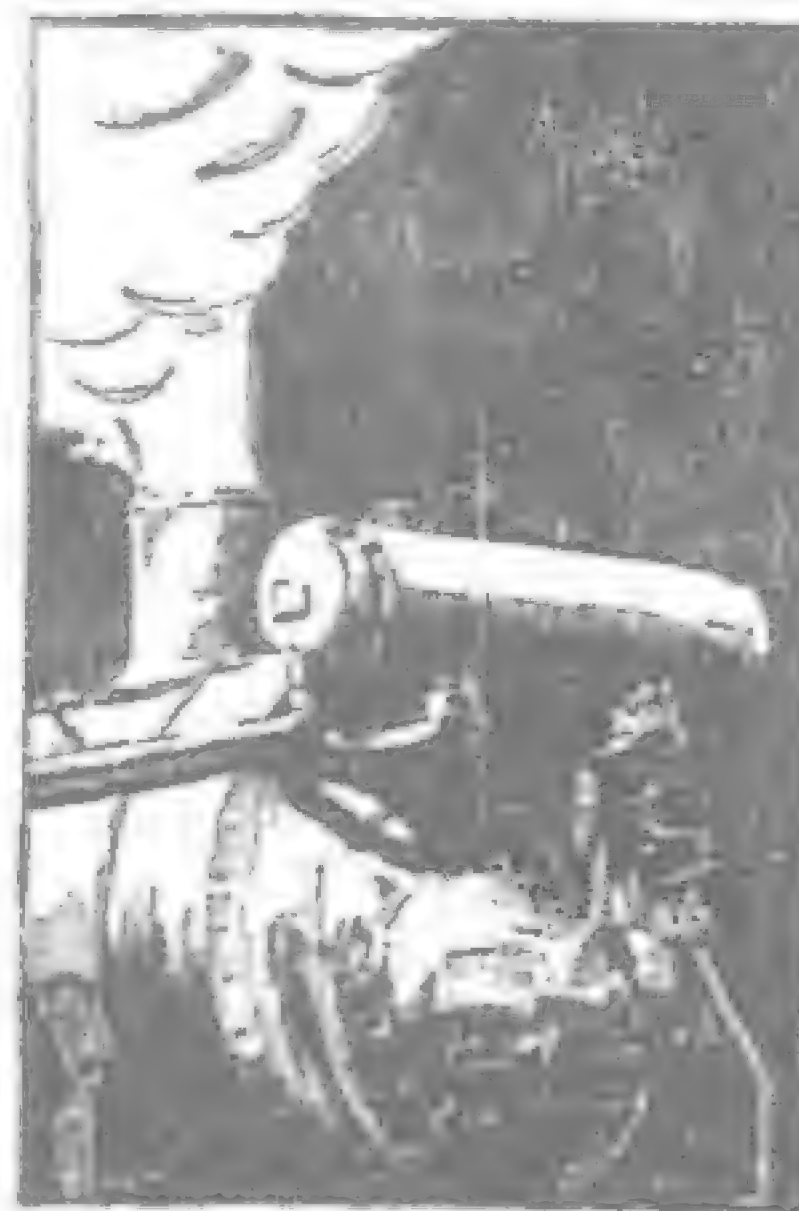
Can be had through any importer of hardware.

Manufactured By:

TRIMONT MANUFACTURING CO.

Established since 1888 at
ROXBURY (Boston), Mass., U. S. A.

30-35 Per Cent Improvement



in locomotive performance

IMPROVEMENT in locomotive performance cannot be discussed without mentioning Elesco superheaters and feed water heaters.

Among advocates of improved boiler designs, for more powerful and more efficient locomotives, there is no difference of opinion as to the necessity for superheating and feed water heating.

Elesco superheaters and feed water heaters perform nearly half the work the boiler otherwise would have to do.

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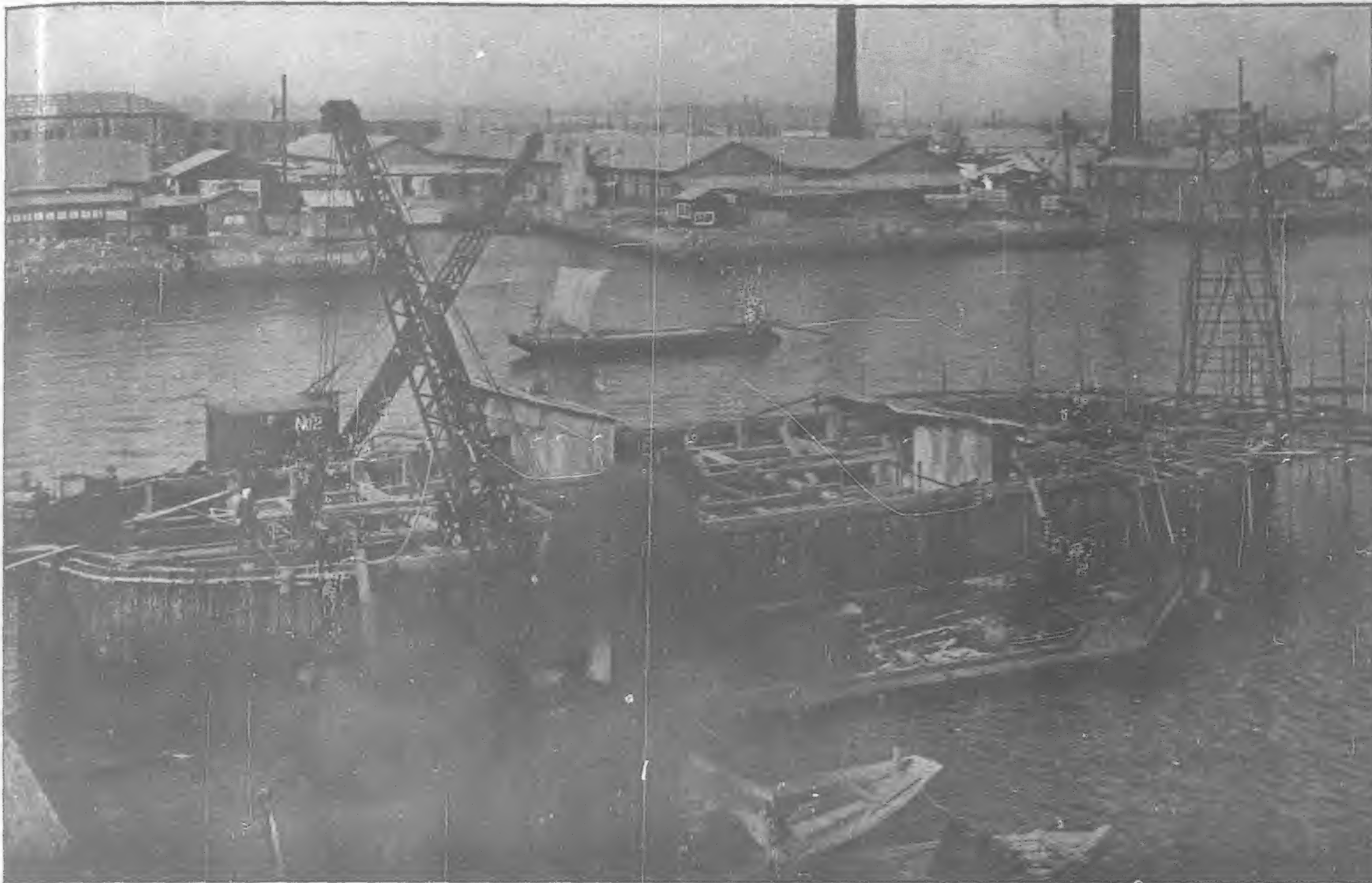


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Eastern Representative: George E. Spengler,

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Designing Engineers and Manufacturers of Elesco Steam Superheaters for Locomotive, Marine and Stationary Services, Locomotive Feed Water Heaters, Locomotive Exhaust Steam Injectors and Pipe Colls.
A-185



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Lackawanna Steel Sheet Piling for Cofferdams in Japan

Lackawanna Piling Cofferdams were used in rebuilding many of the bridges destroyed in the great earthquake in Tokyo, September, 1923.

Here, as in many other parts of the world, the ease and speed with which these piling sections could be driven to produce water-tight cofferdams, led the engineers in charge to specify and use Lackawanna Steel Sheet Piling.

Lackawanna Piling is the solution of many foundation-construction problems. Whenever water or unstable earth is to be retained, Lackawanna Piling is the efficient and economical

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Cable Address: Bethlehem, New York

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The
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ELECTRICAL ENGINEERS AND MANUFACTURERS

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London Office "Crown House," Aldwych, London, W.C.2, England.

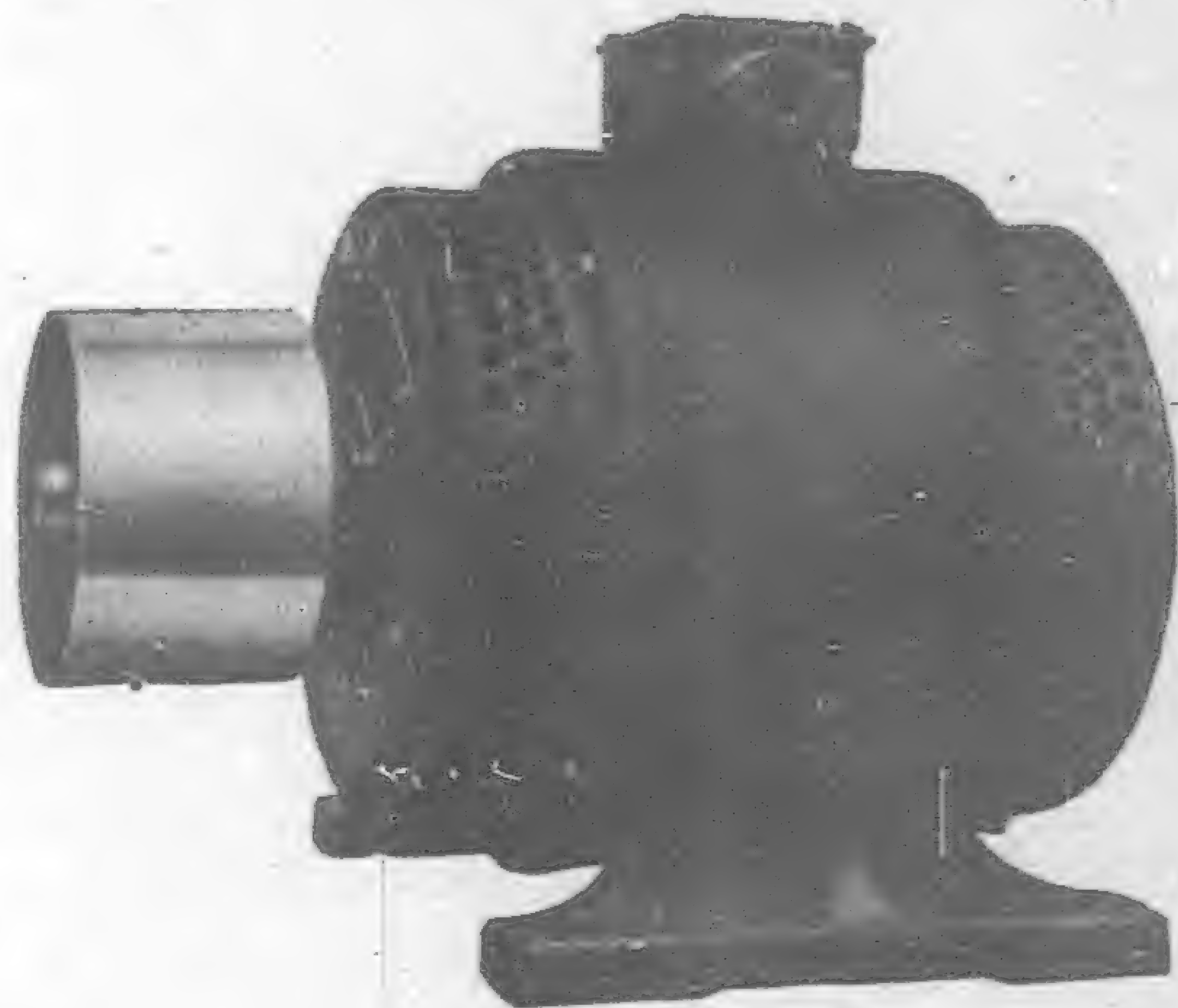
Works:—Rugby, Birmingham, Willesden, Coventry and Chesterfield.

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This Company manufactures A.C. and D.C. motors and control gear for all machine-tool applications—individual or group drives.

Single and polyphase, constant and variable speed motors.



Even torrents are no impediment to the **MENCK SHOVEL on CATERPILLARS**



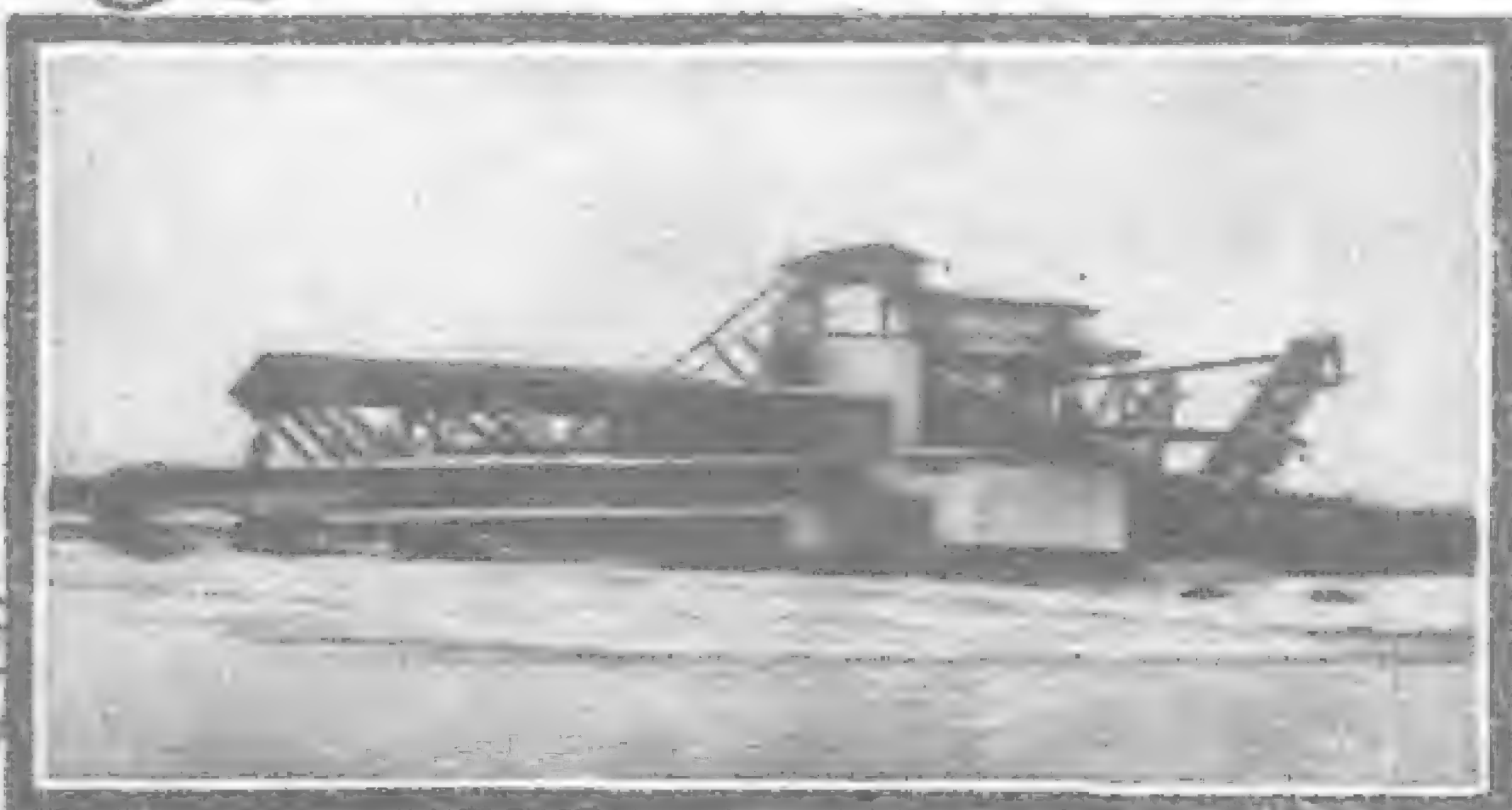
This MENCK EXCAVATOR on CATERPILLARS went through a 38 yd. wide torrent; as can be seen on above photo, the under-carriage was sometimes entirely submerged owing to the high current. While crossing-over, the dipper tapped the bed of the river, in order to prevent the shovel from falling into holes.

Doesn't this prove the extraordinary high movableness of Menck excavators and the insensibility of their caterpillars!

MENCK & HAMBROCK
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Combining rugged simplicity with efficiency in excavating and reclaiming the largest possible percentage of metal, Bucyrus-Erie offers for alluvial gold, platinum and tin mining a complete line of dredges.

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The Osgood Conqueror
Heavy Duty Shovel.
Built with either petrol
or electric motor drive.
Strongest and most
powerful machine of its
kind in the world



STAMINA!

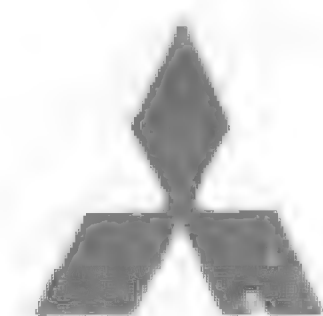
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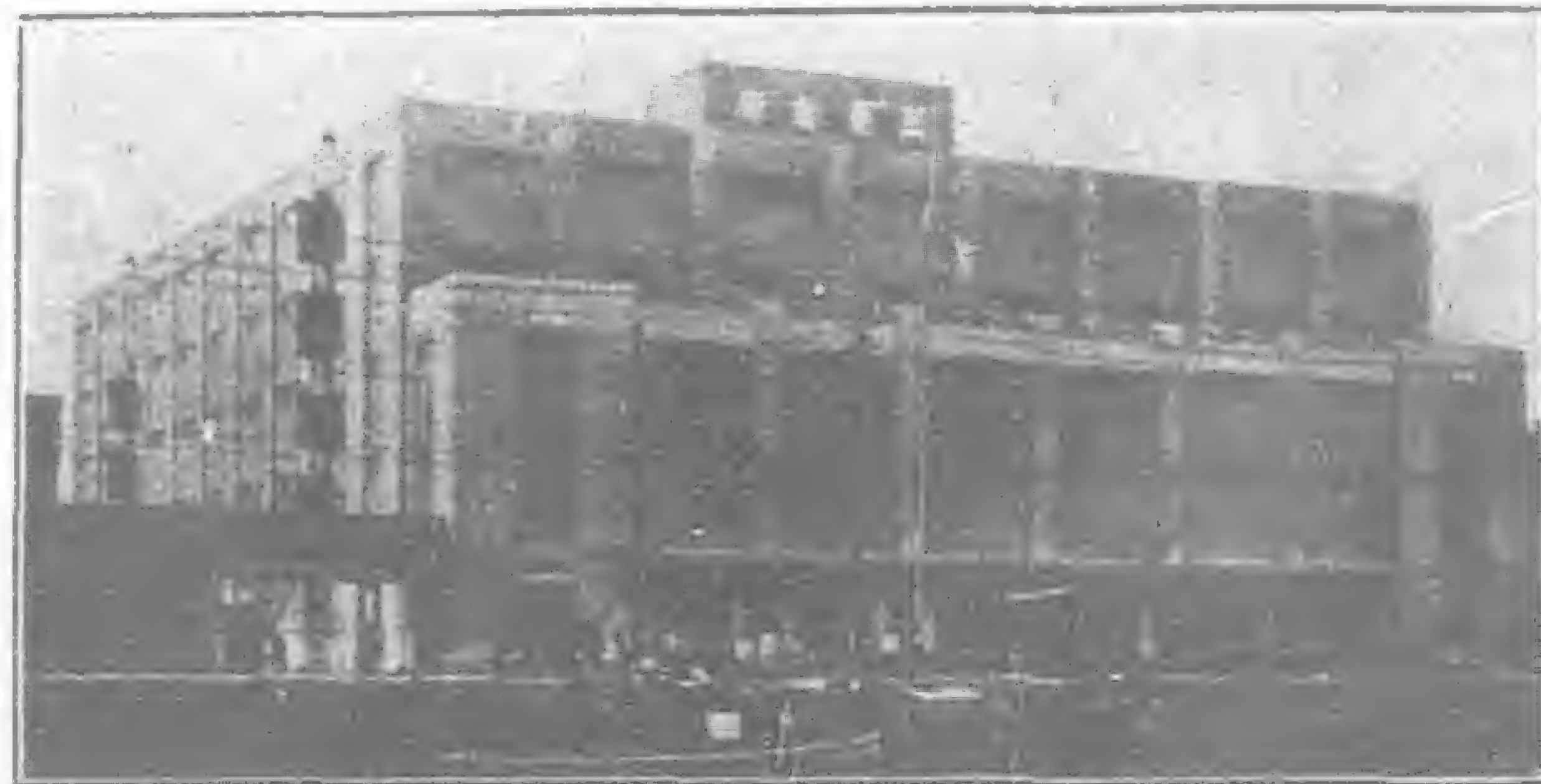
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LANDING, SHIPPING AND
FORWARDING AGENTS,
STEVEDORES, CUSTOMS
BROKERS & WAREHOUSEMEN

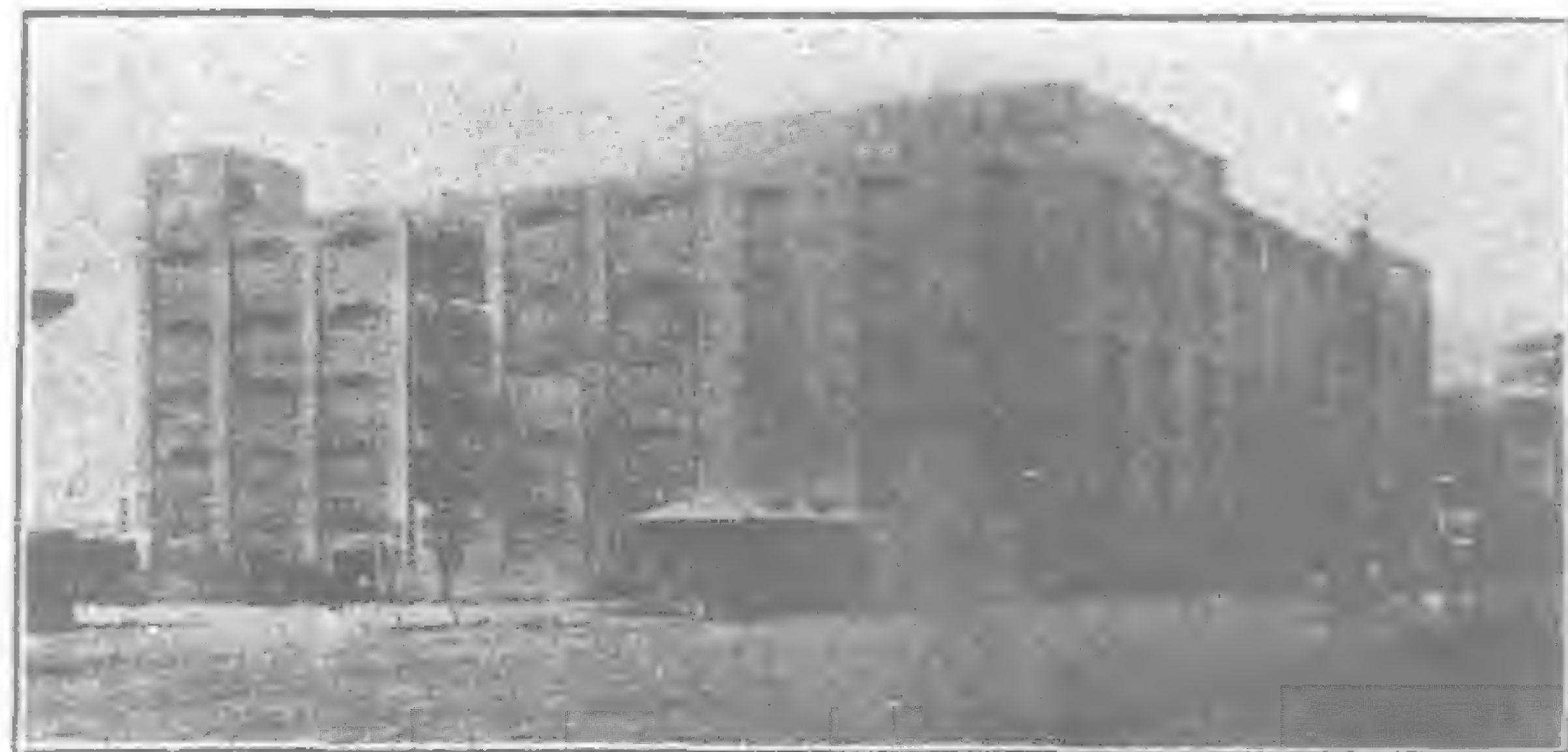
Capital Paid up - - Yen 10,000,000
Reserve - - - - - Yen 8,000,000

President: I. TANIMOTO

Managing Director: S. MITSUHASHI



WAREHOUSE AT OSAKA



WAREHOUSE AT KOBE

Head Office: MARUNOUCHI, TOKYO
Branches: TOKYO, YOKOHAMA, KOBE,
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General Managers of the

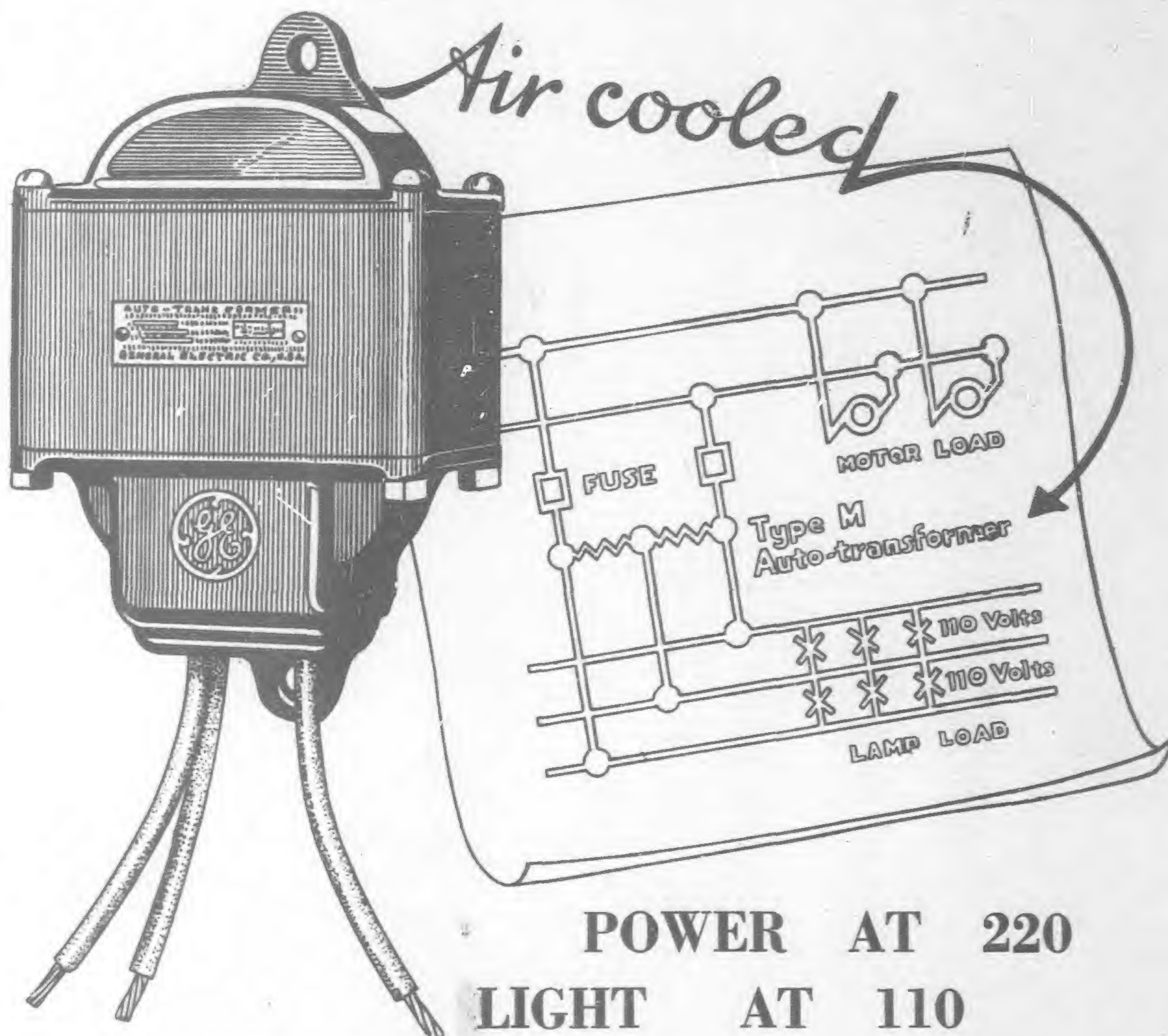
**KYODO UNYO KABUSHIKI
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DOMESTIC APPLIANCES AT 110

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Head Office:
HONCHO, NIHOMBASHI-KU, TOKIO



Capital Fully Paid: Yen. 100,000,000

Reserve Fund: Yen. 53,280,000

(Nov. 1927)

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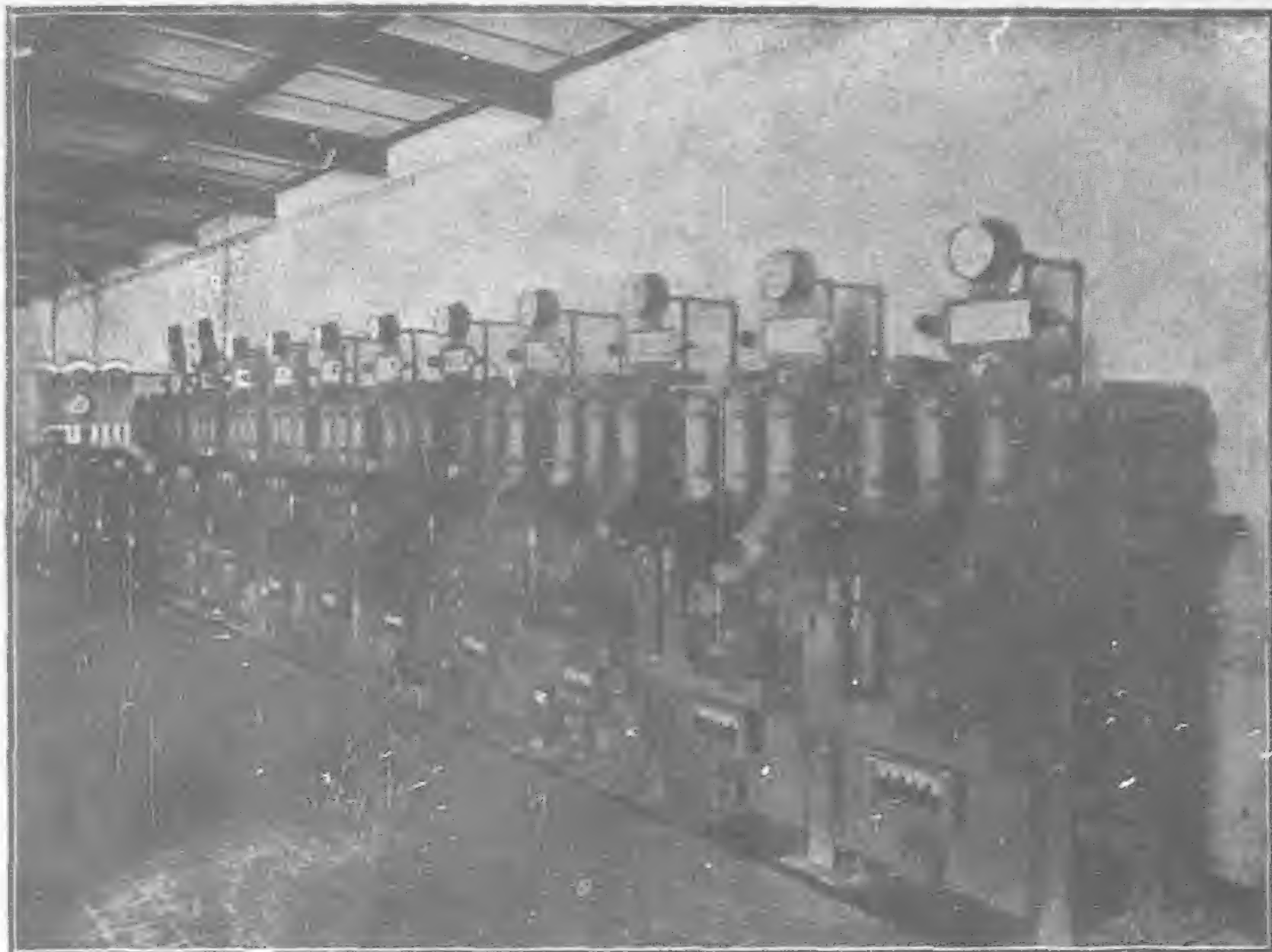
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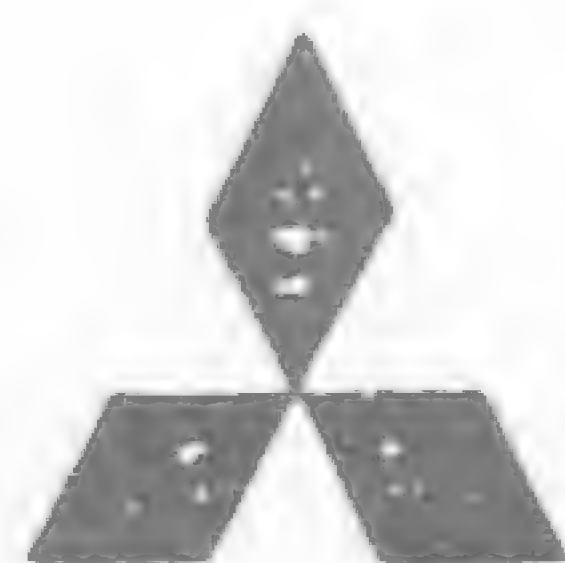
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MILL (LLOYD'S APPROVED):
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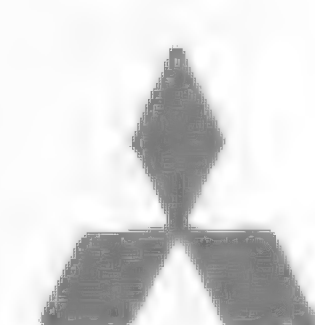
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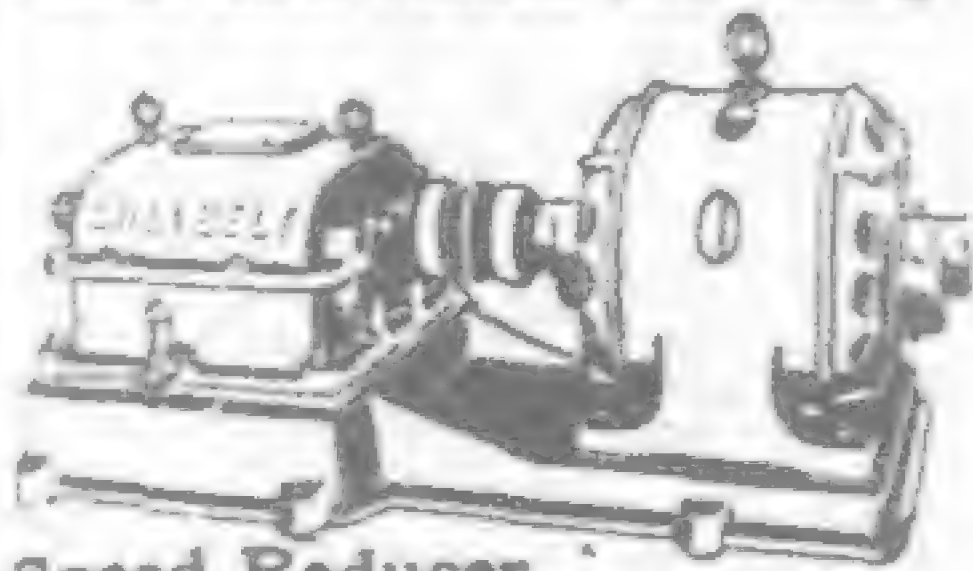
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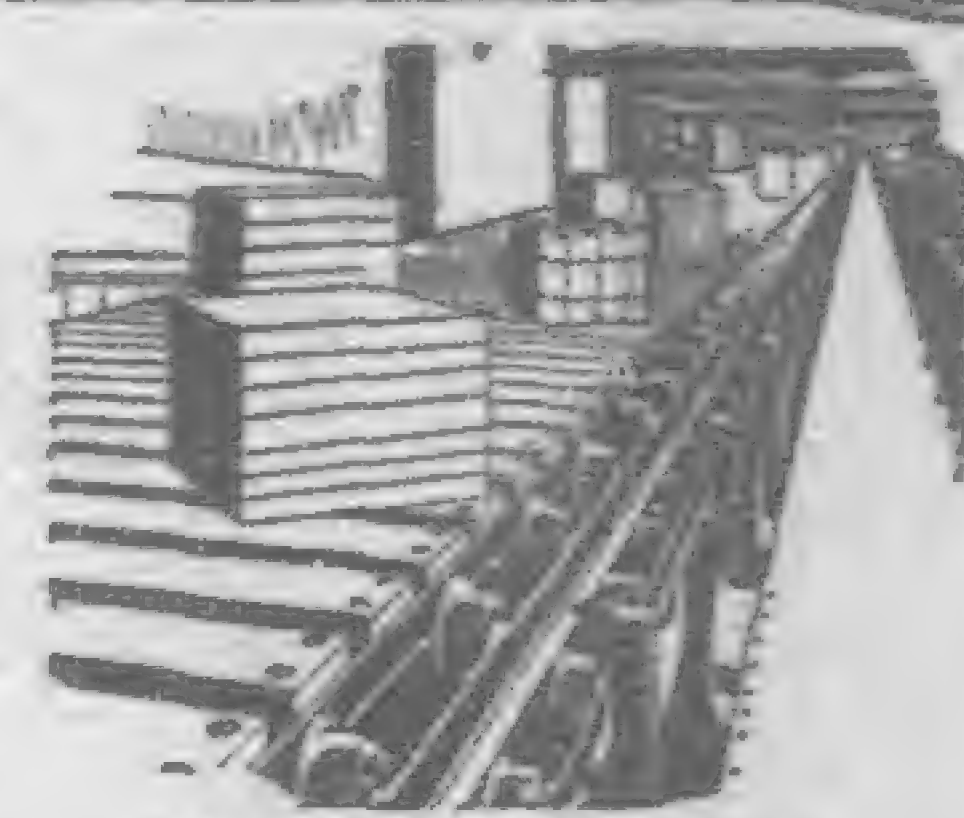
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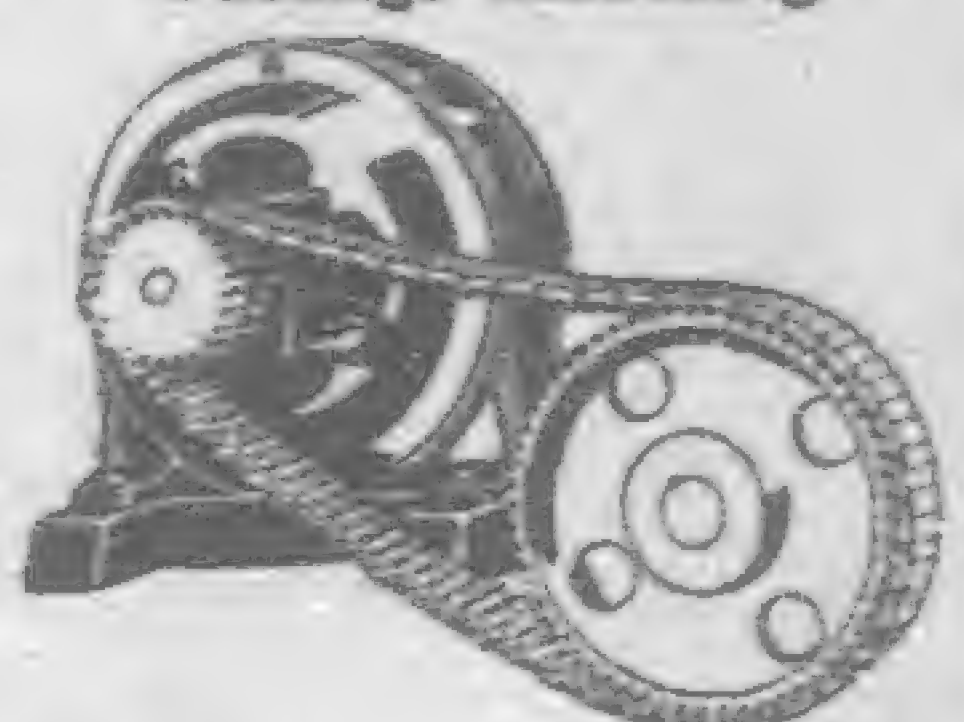
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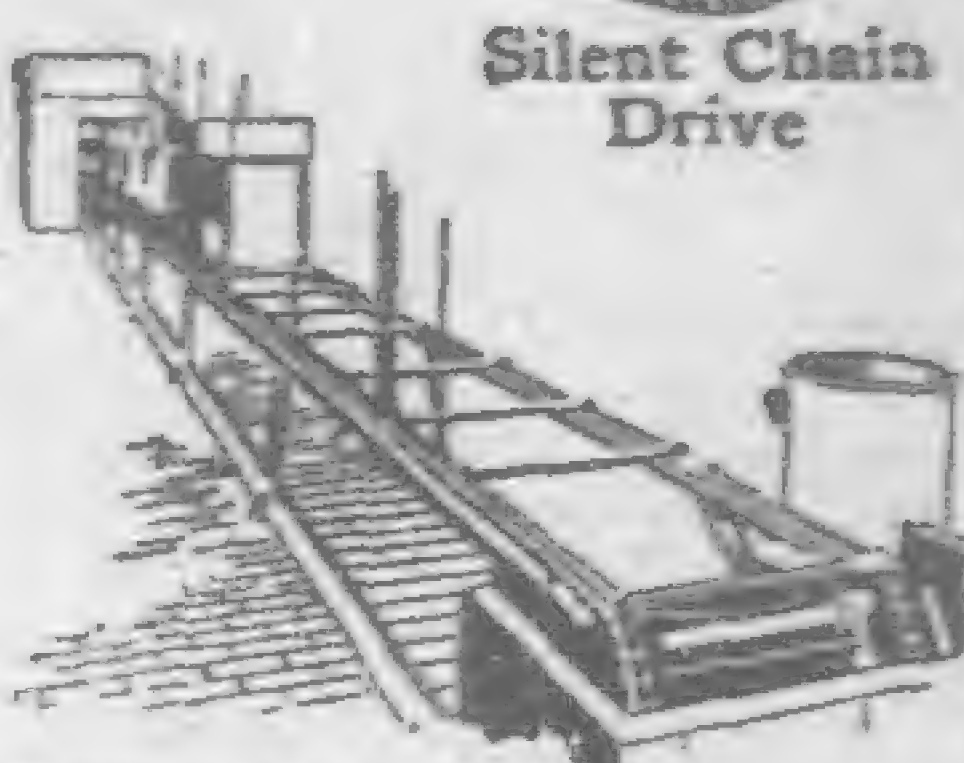
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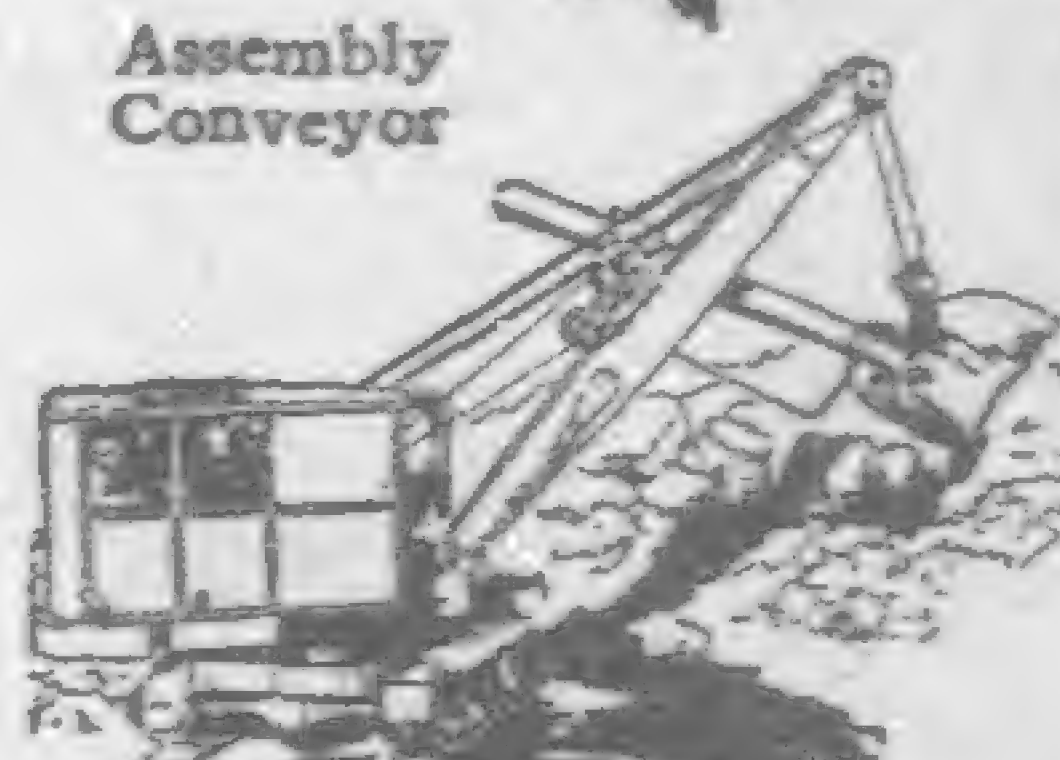
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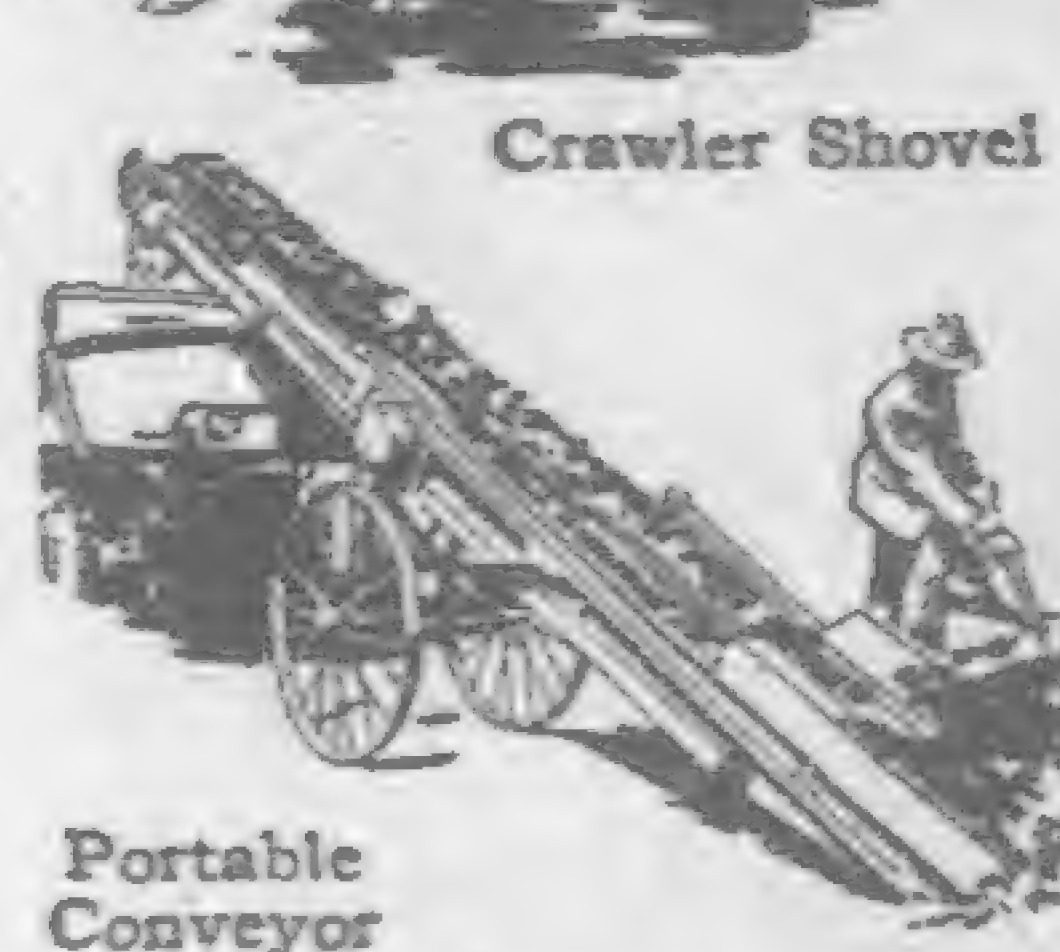
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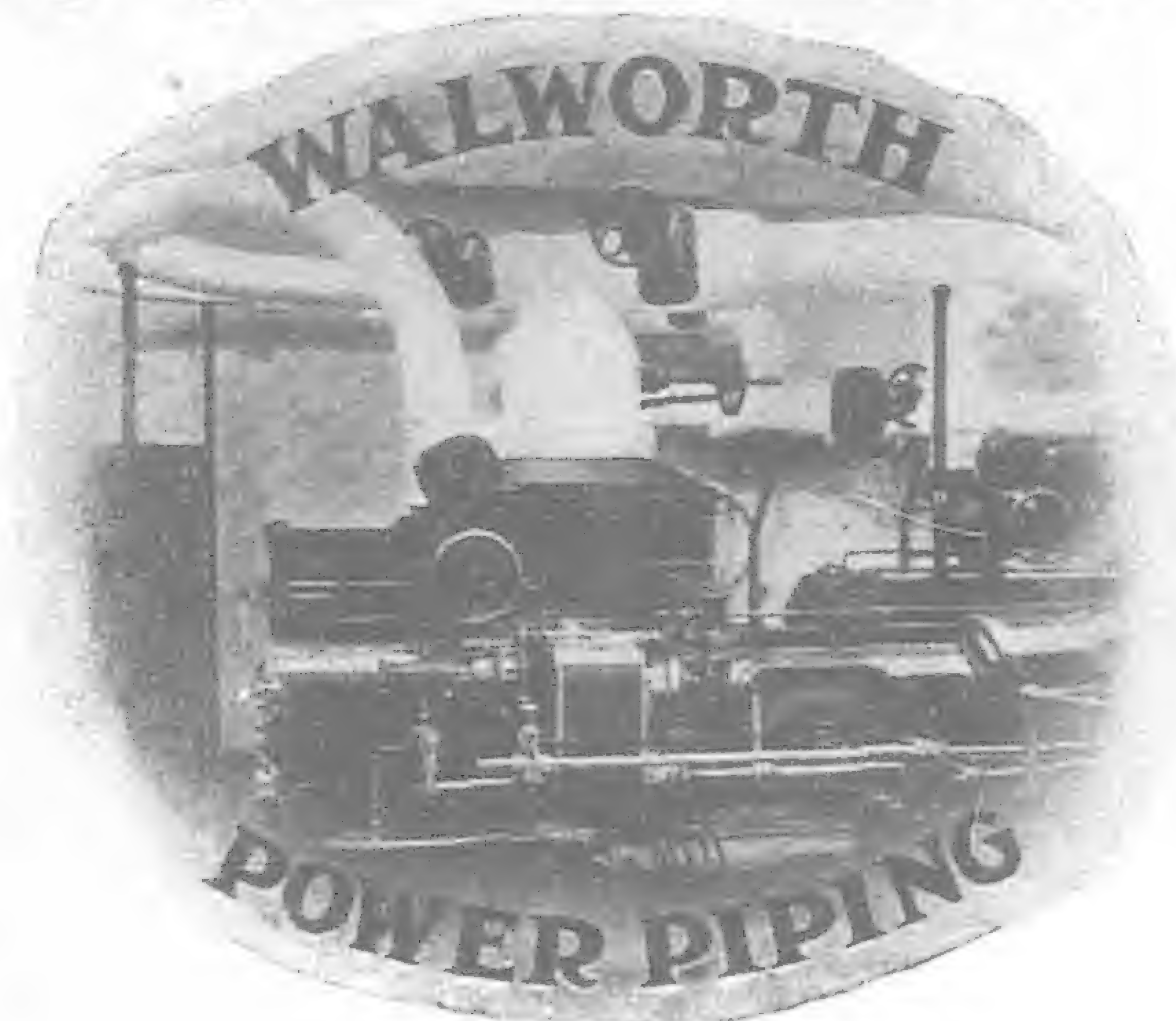
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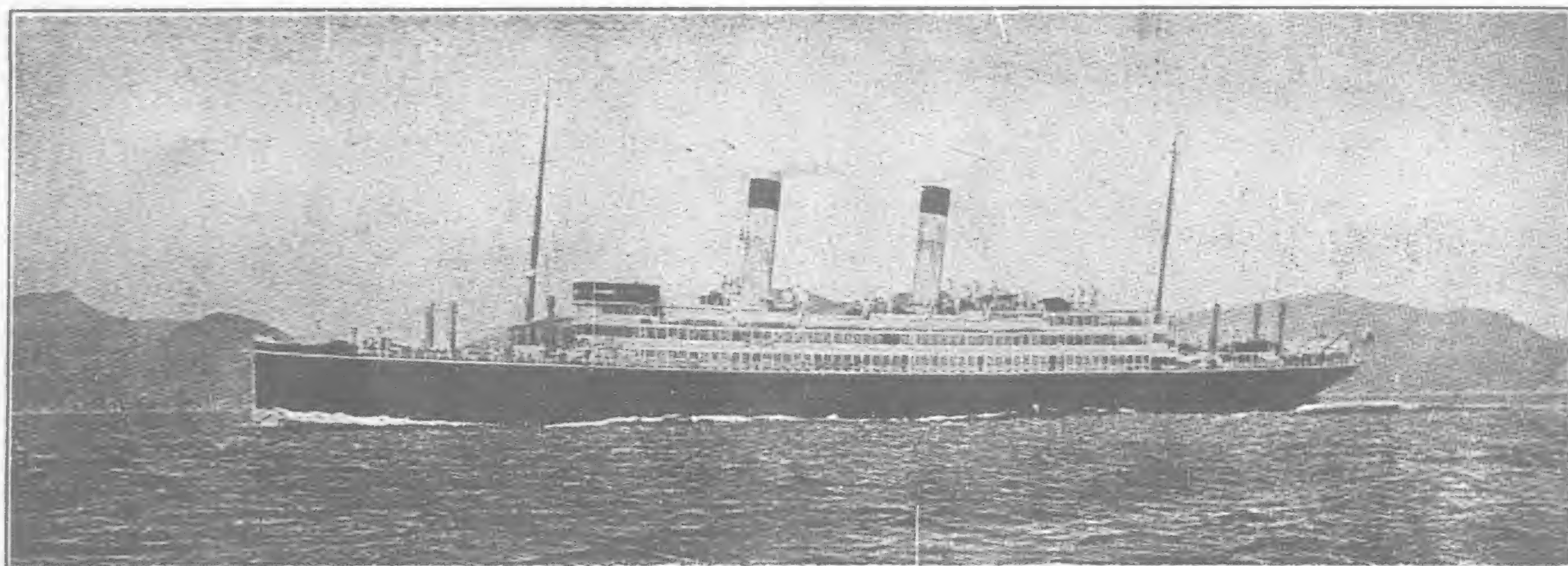
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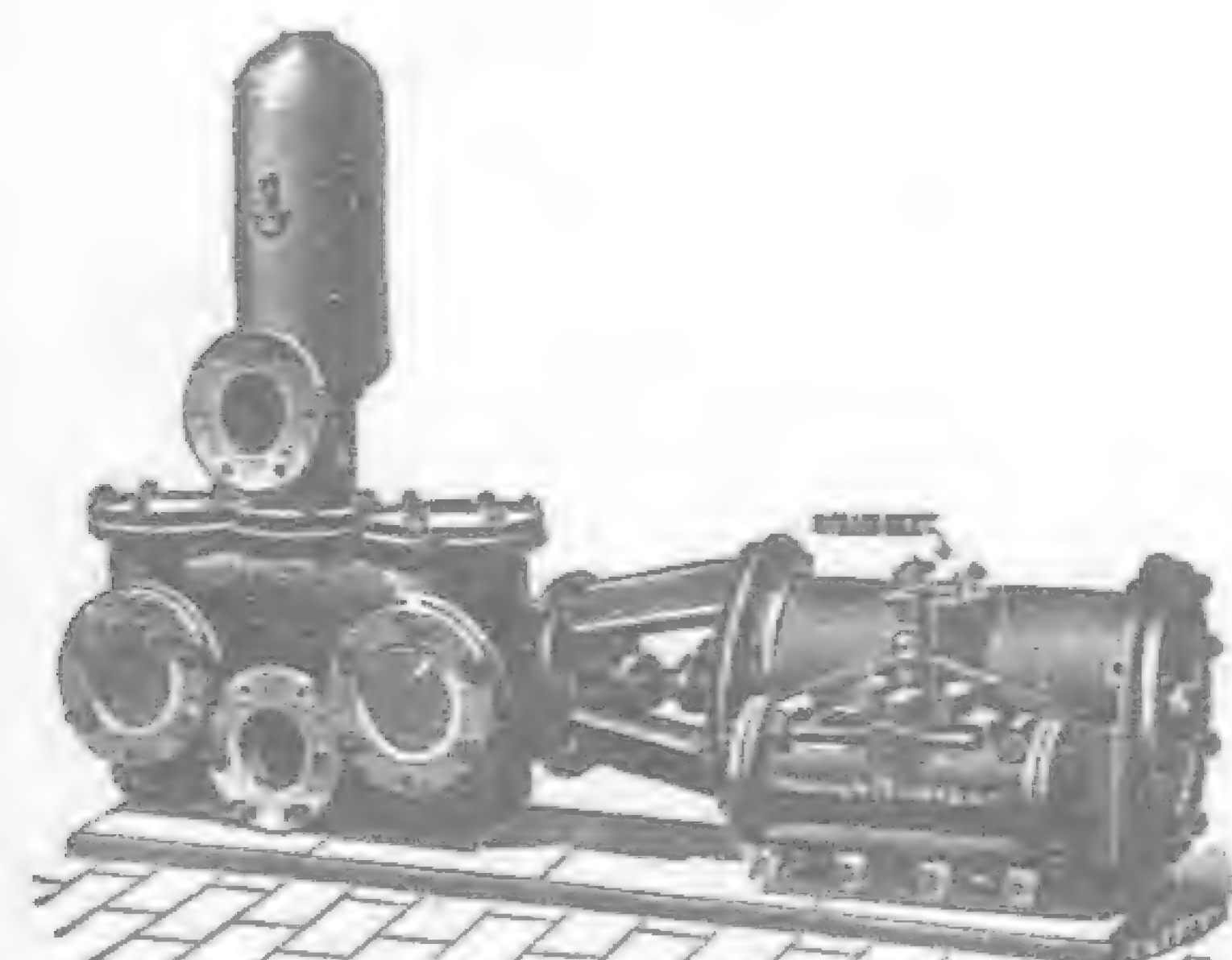
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" " " " Bottom	77 "	" " " " Bottom	53 "	" " " " Bottom	88½ "
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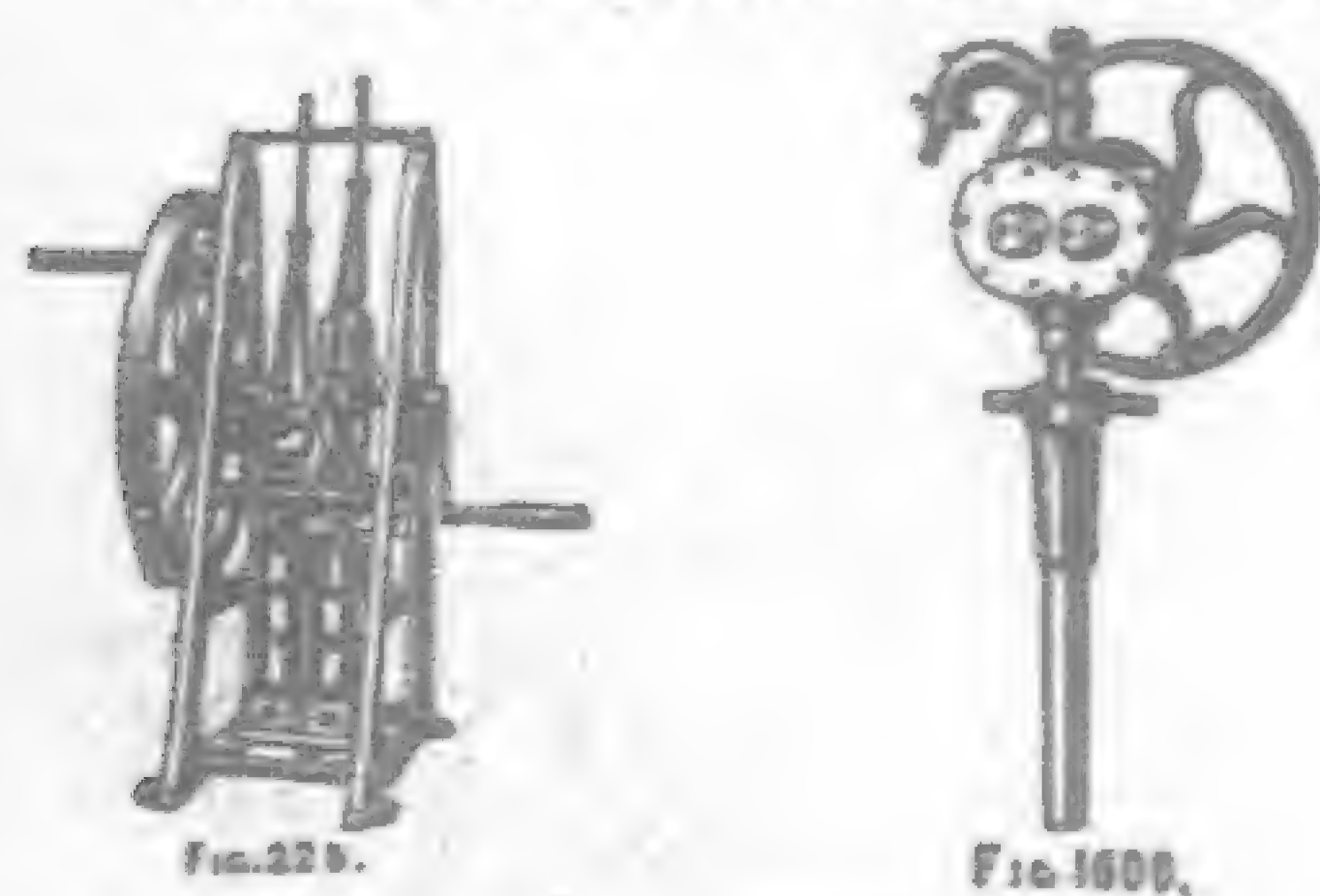


Fig. 22 b.

Fig. 1600.

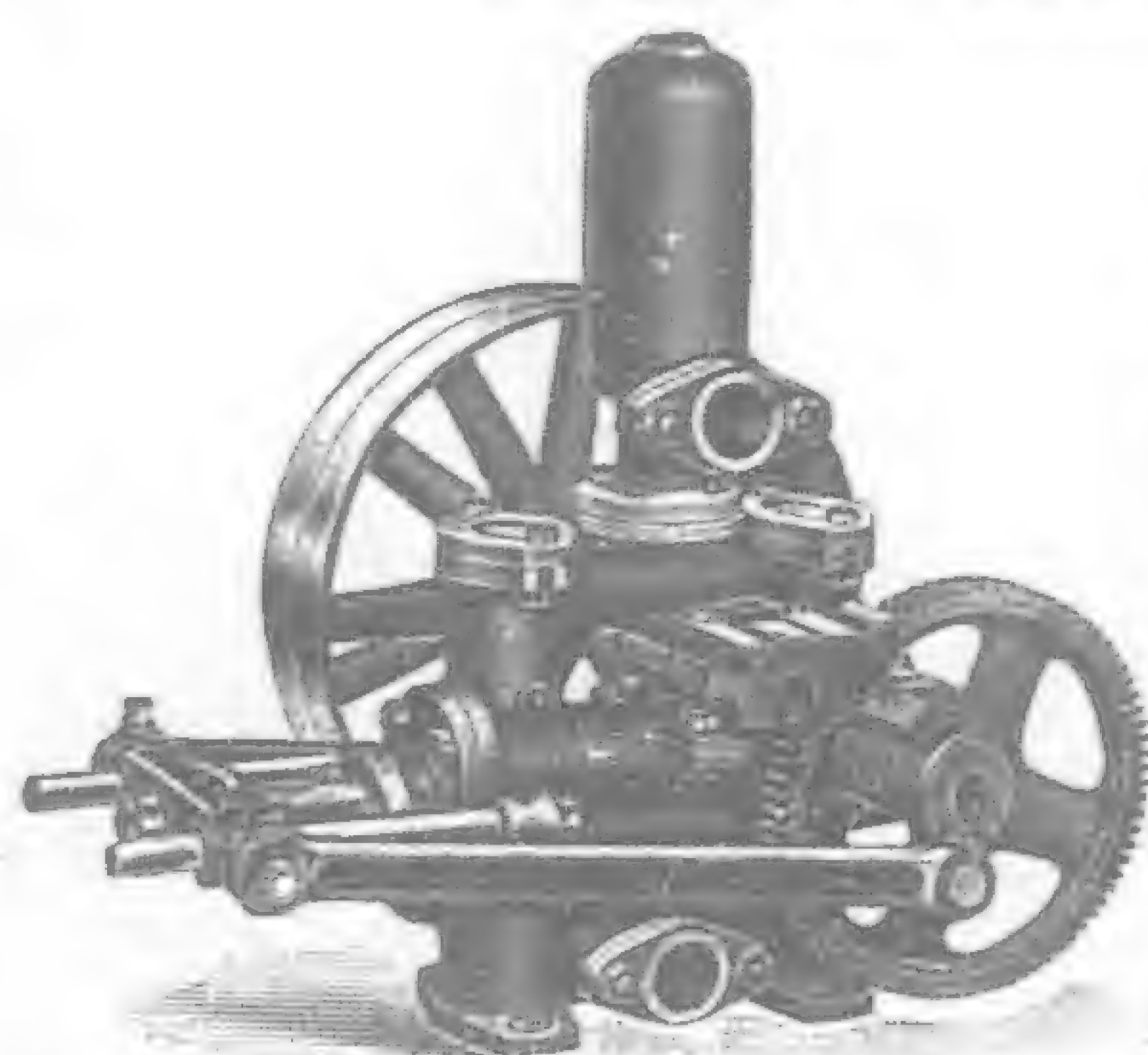
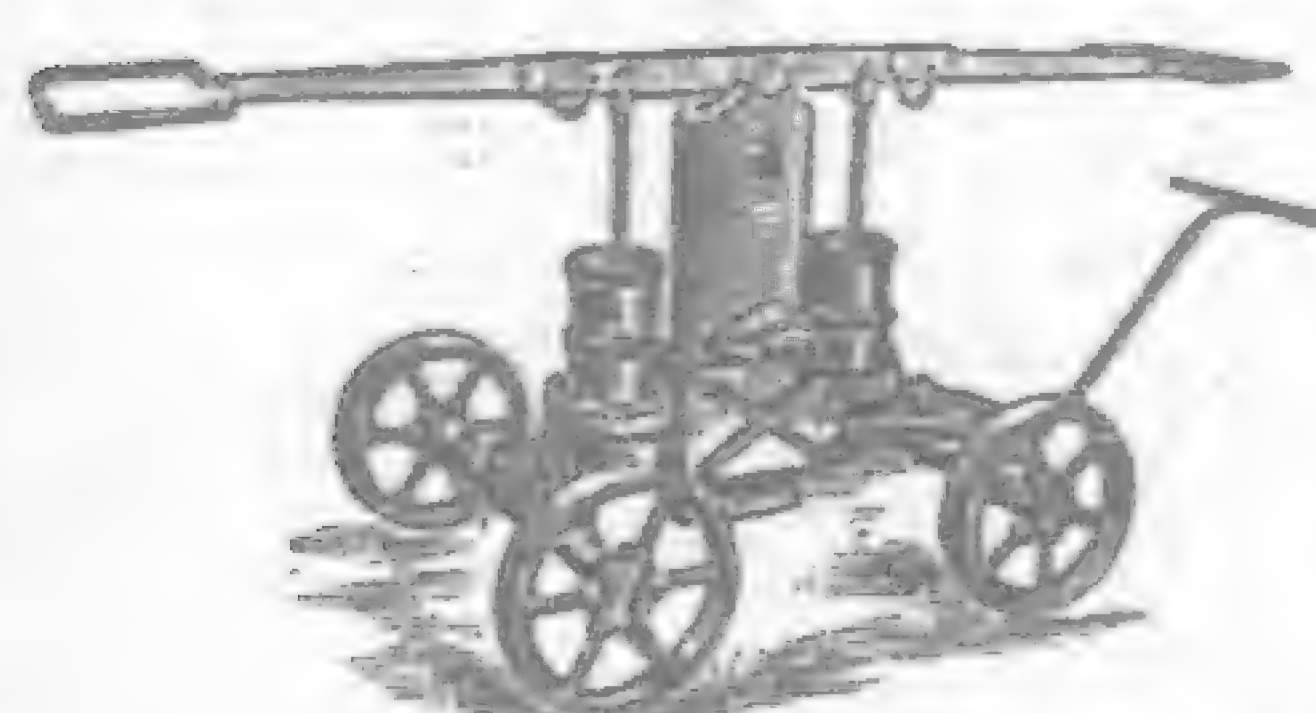


Fig. 831—Double Acting Belt Driven Pump

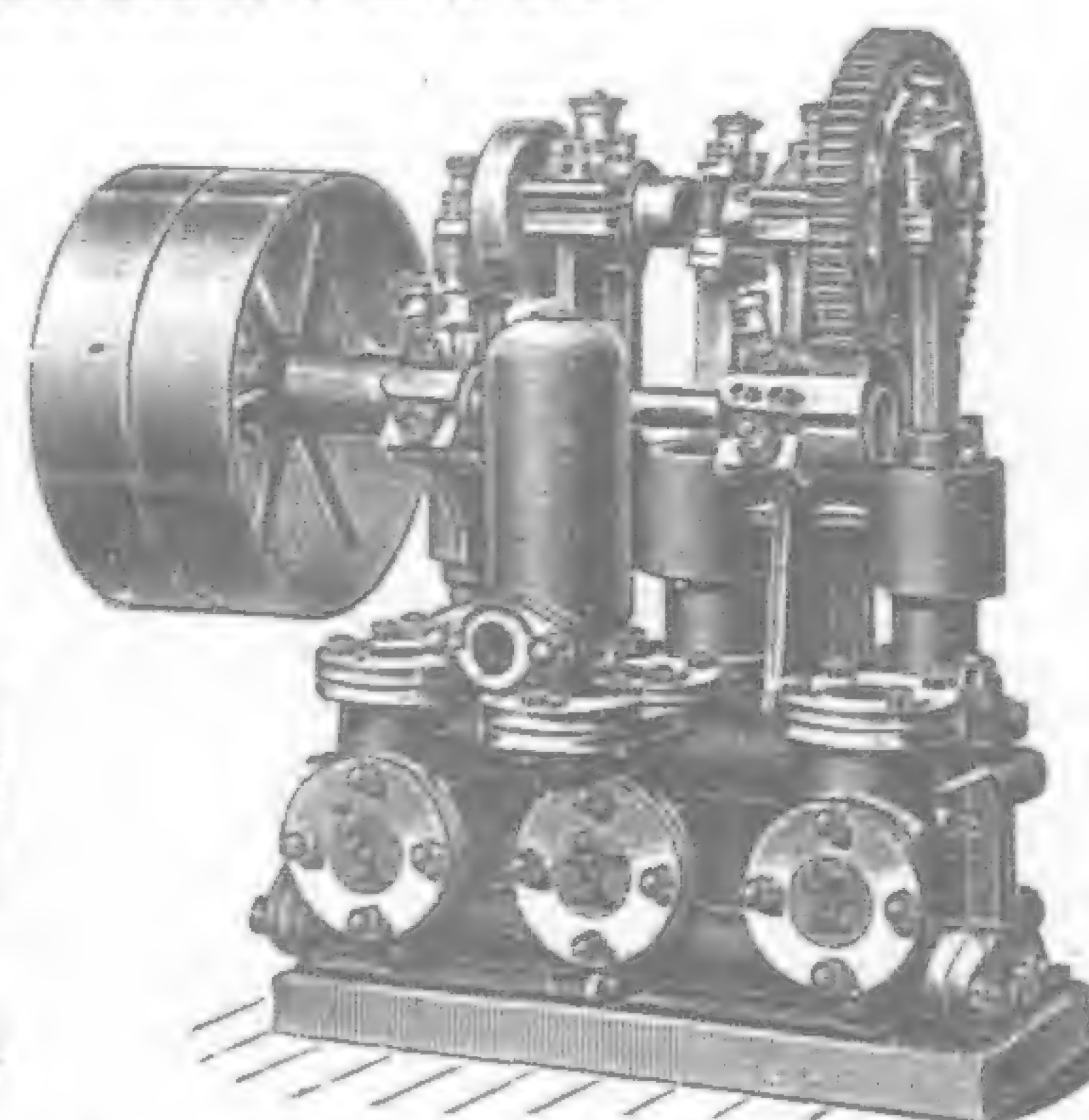
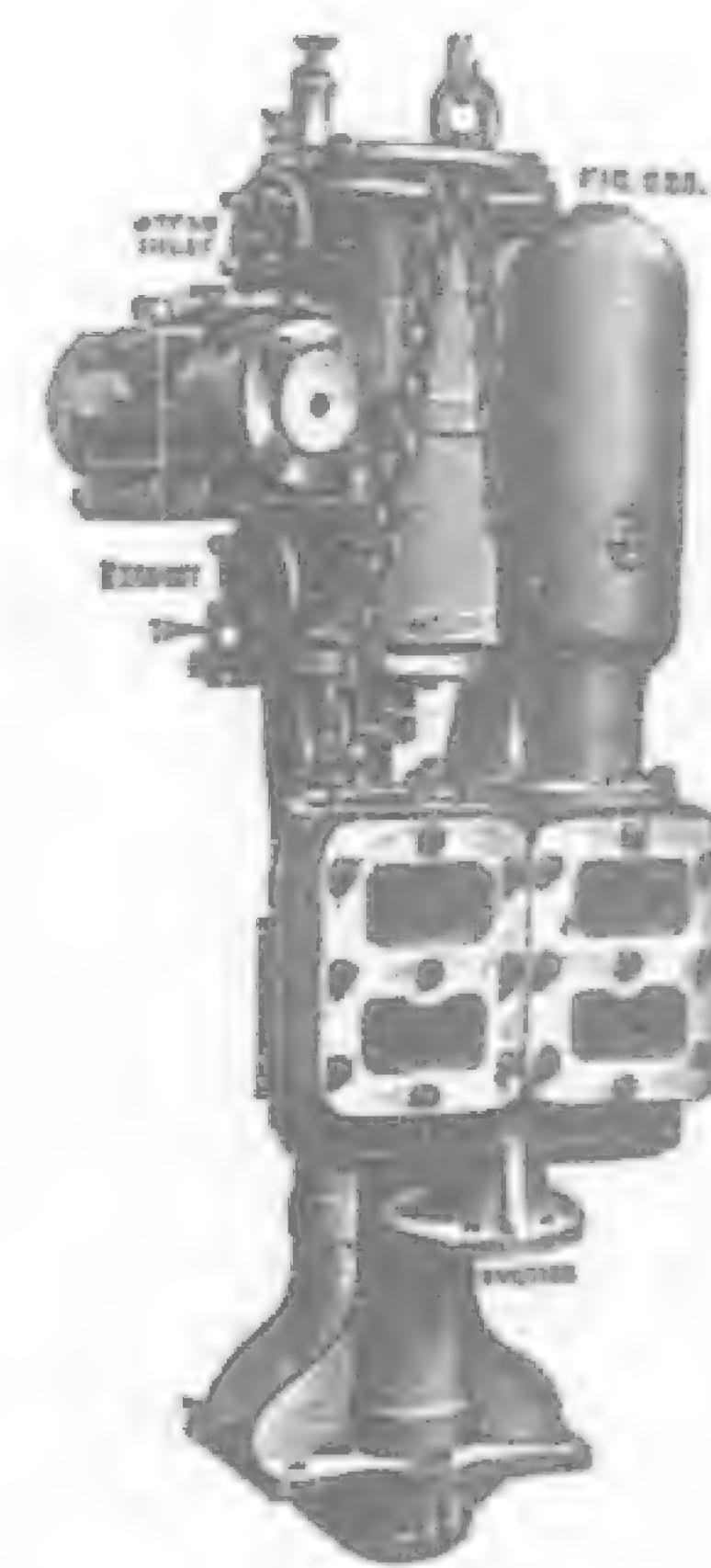


Fig. 842—Treble Ram Pump for Belt or Electric Drive



Sinking Pumps for Collieries, Mines, Etc.



Fig. 191.

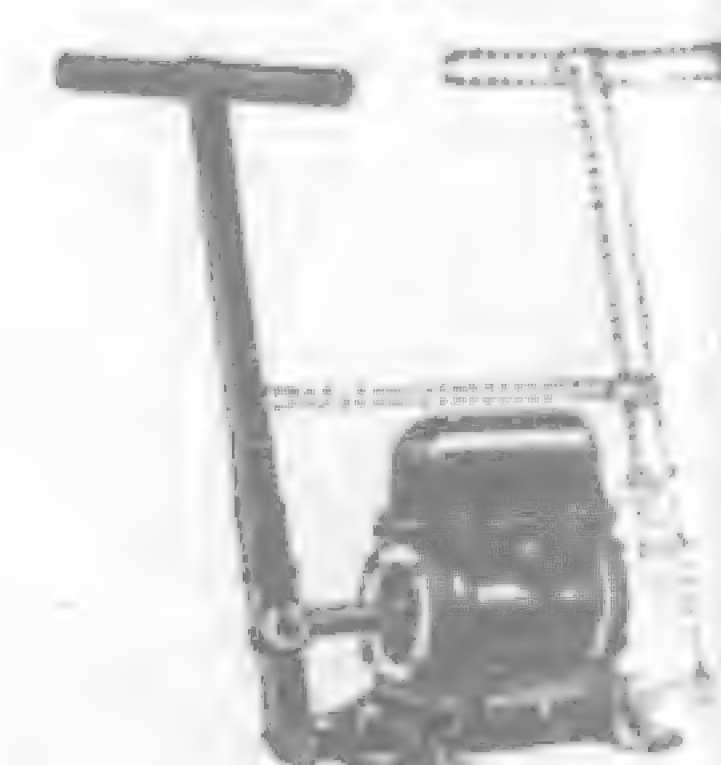


Fig. 105.

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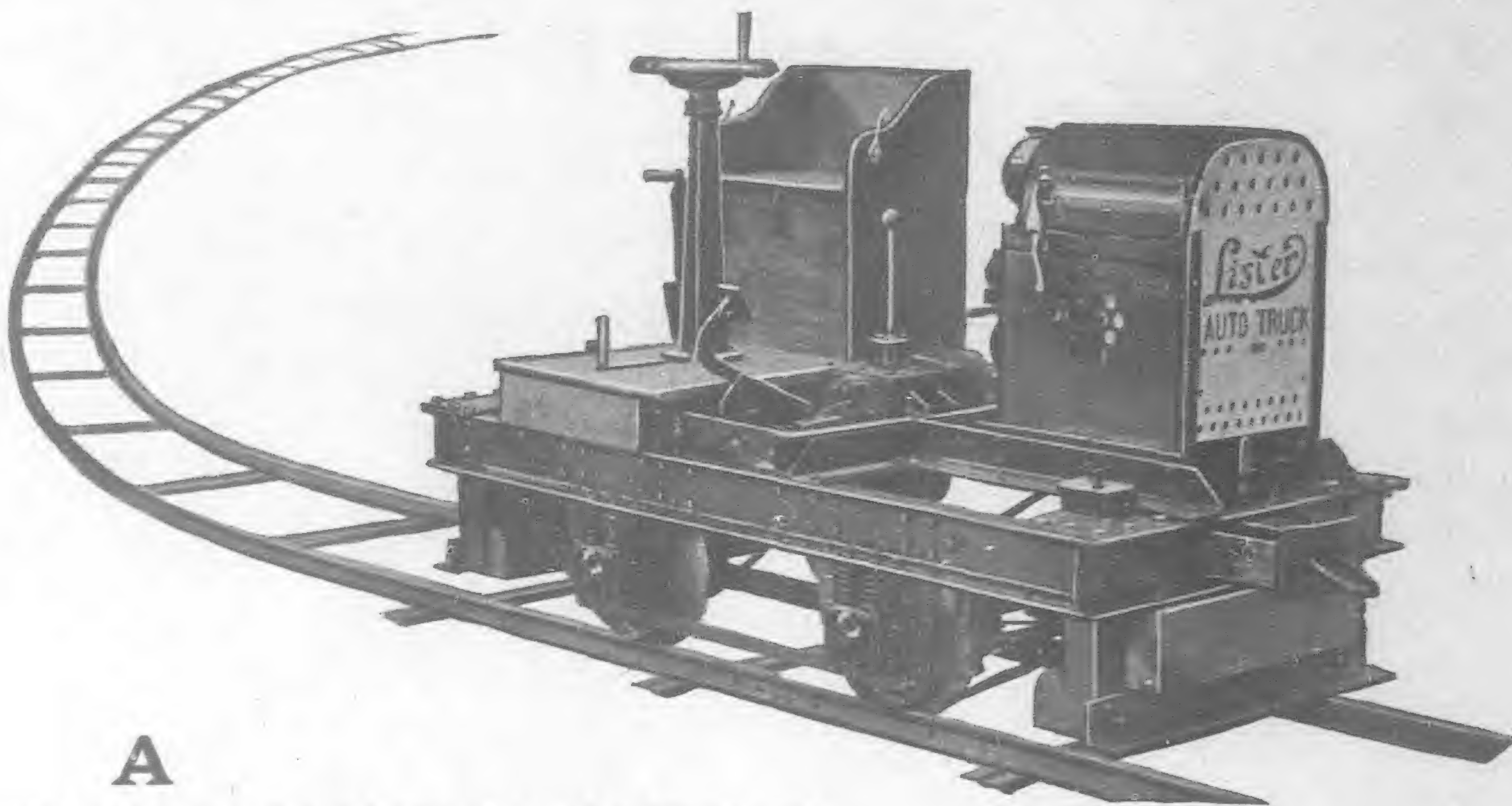
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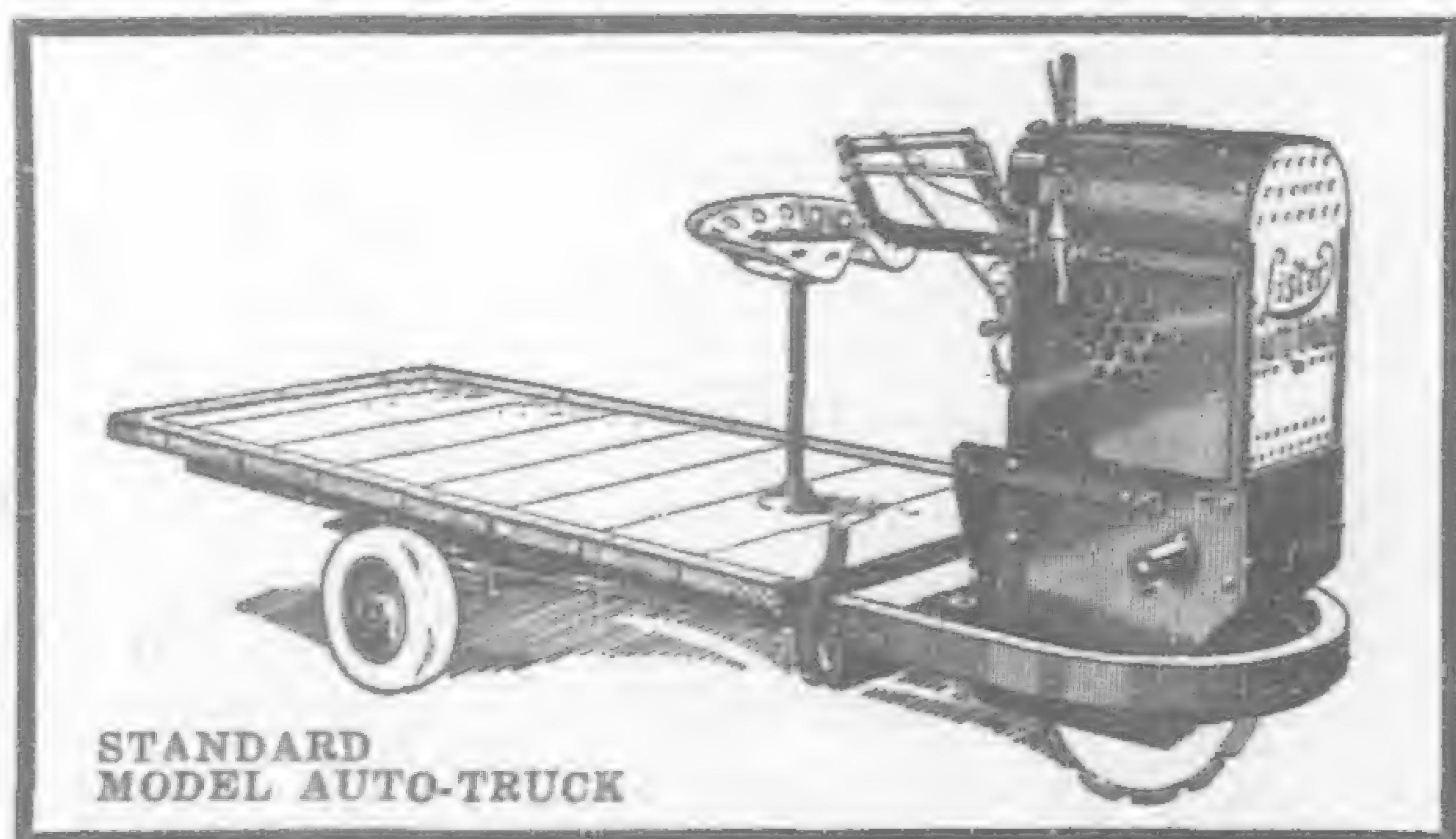


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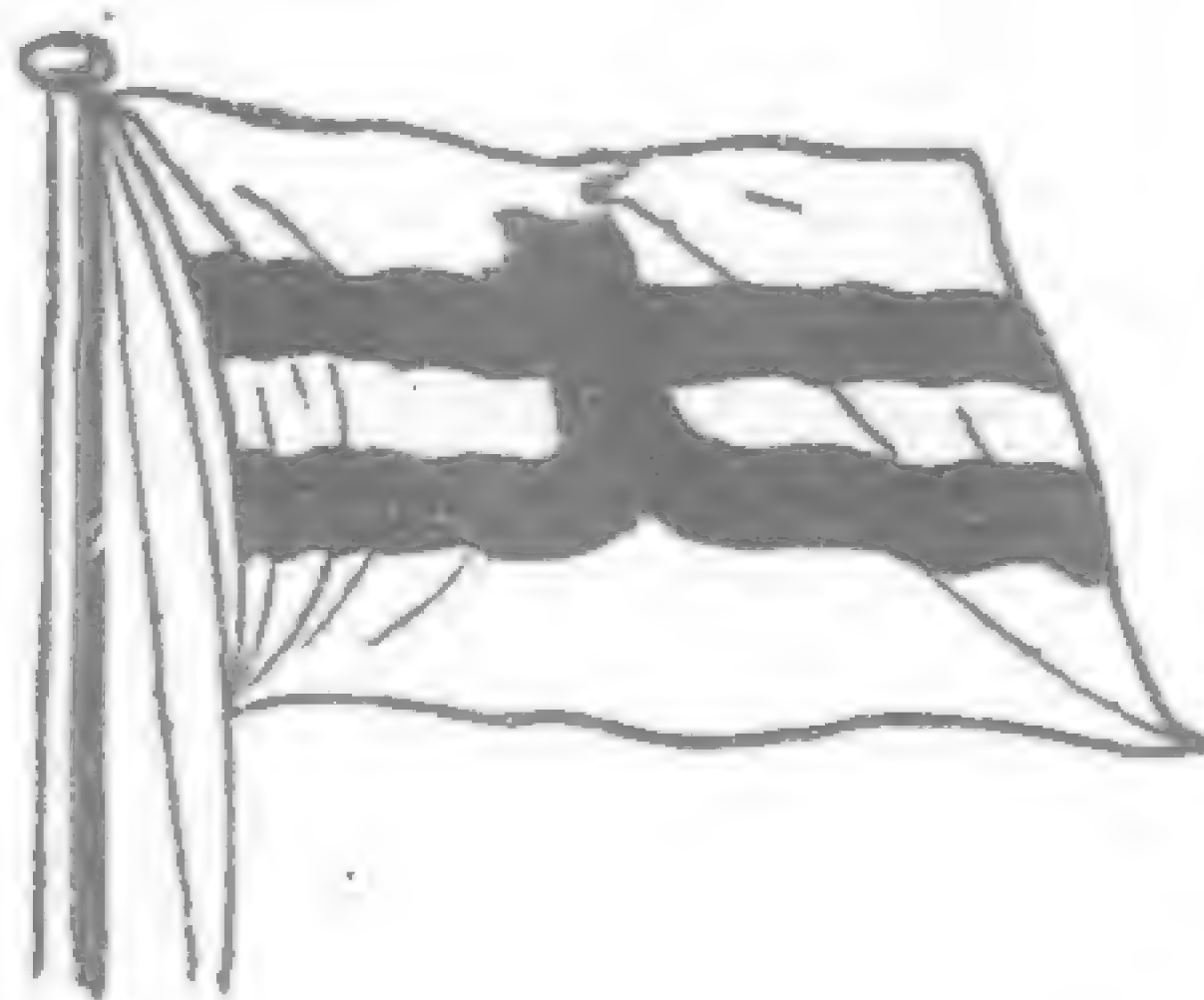
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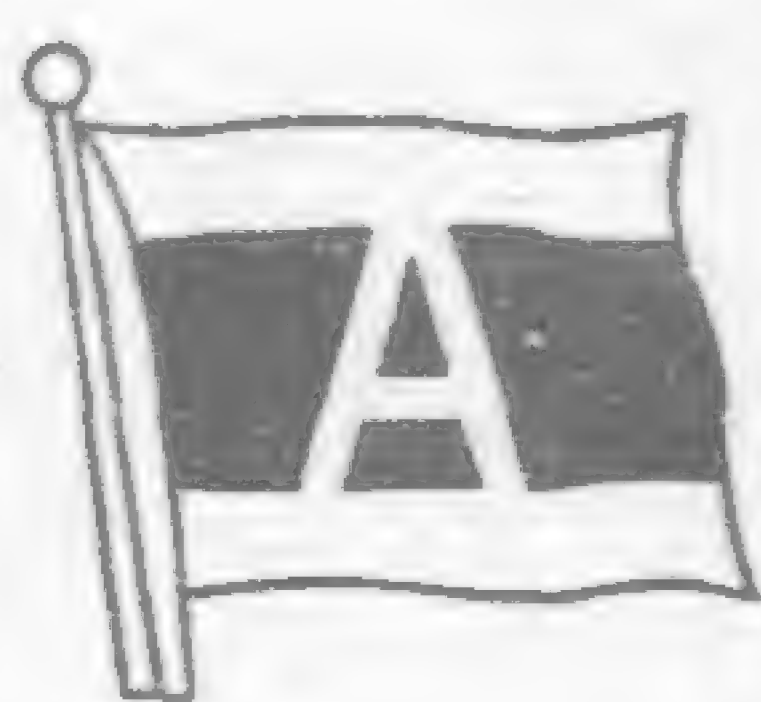
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<p align="center">CHINA NAVIGATION CO., LTD.</p> <p align="center">— Passenger and Freight Steamship Services —</p> <p>SHANGHAI TO, AND FROM, Weihaiwei, Chefoo and Tientsin (for Peking); Tsingtao, Newchwang; Antung. Hankow, Ichang, Chungking. Chang- sha, and Intermediate Yangtze Ports. Hongkong and Can- ton; Amoy and Swatow; Ningpo; and General Coast- ing Services.</p> <p>HONGKONG TO, AND FROM, Weihaiwei, Chefoo and Tientsin (for Peking) Canton; Hoihow, Pakhoi and Hai- phong; Bangkok and Singapore. Amoy and Swatow. Shanghai and Yangtze Ports (as above) Sydney, Melbourne and Australian Ports (Australian-Oriental Line)</p>	<p align="center">TAIKOO SUGAR REFINING CO., LTD.</p> <p align="center"></p> <p align="center">F I N E S T C A N E S U G A R S</p>	<p align="center">TAIKOO DOCKYARD & ENGINEER- ING COMPANY OF HONGKONG LIMITED</p> <p align="center">— Ship Builders, Ship Repairers, Engine Builders, Boiler Makers, etc.</p>	<p align="center">INSURANCE FIRE, MARINE, MOTOR CAR, BURGLARY AND SPECIAL RISKS</p> <p align="center">— FIRE —</p> <p>London and Lancashire Insurance Co., Ltd. Royal Exchange Assurance Corporation. Guardian Assur- ance Co., Ltd. Orient Insurance Company. British Traders Insurance Co., Ltd. Sea Insurance Co., Ltd. British & Foreign Marine Insur- ance Co., Ltd. Standard Marine Insurance Co., Ltd.</p>
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WITH CONJUGATE MOVEMENT

TELOC TYPE

Chart Feed on a Mileage Basis of 10 m/m per Mile.

INDICATES:—Speed.

Total mileage since application of Instrument.

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Time of Day in Hours and Minutes.

RECORDS BY SILVER STYLUS:—Speed attained at any point of run.

Time the engine or coach is at work.

Distance covered.

Duration (up to 24 hours) and point of stops.

Time of Day in Hours and Minutes.

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RECORDS BY NEEDLE PUNCTURES:—Speed attained at any point of the run.

Time the engine or coach is at work.

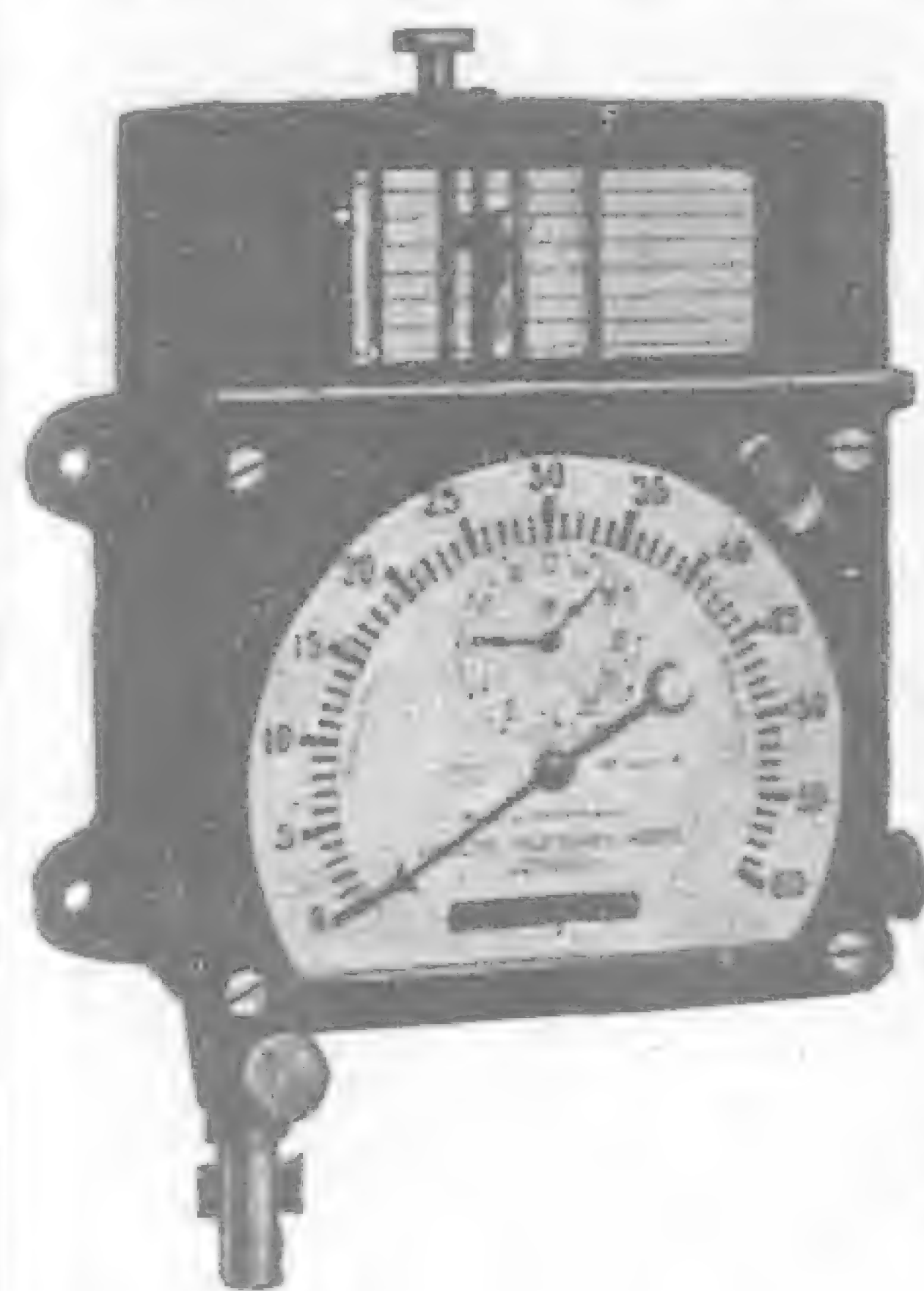
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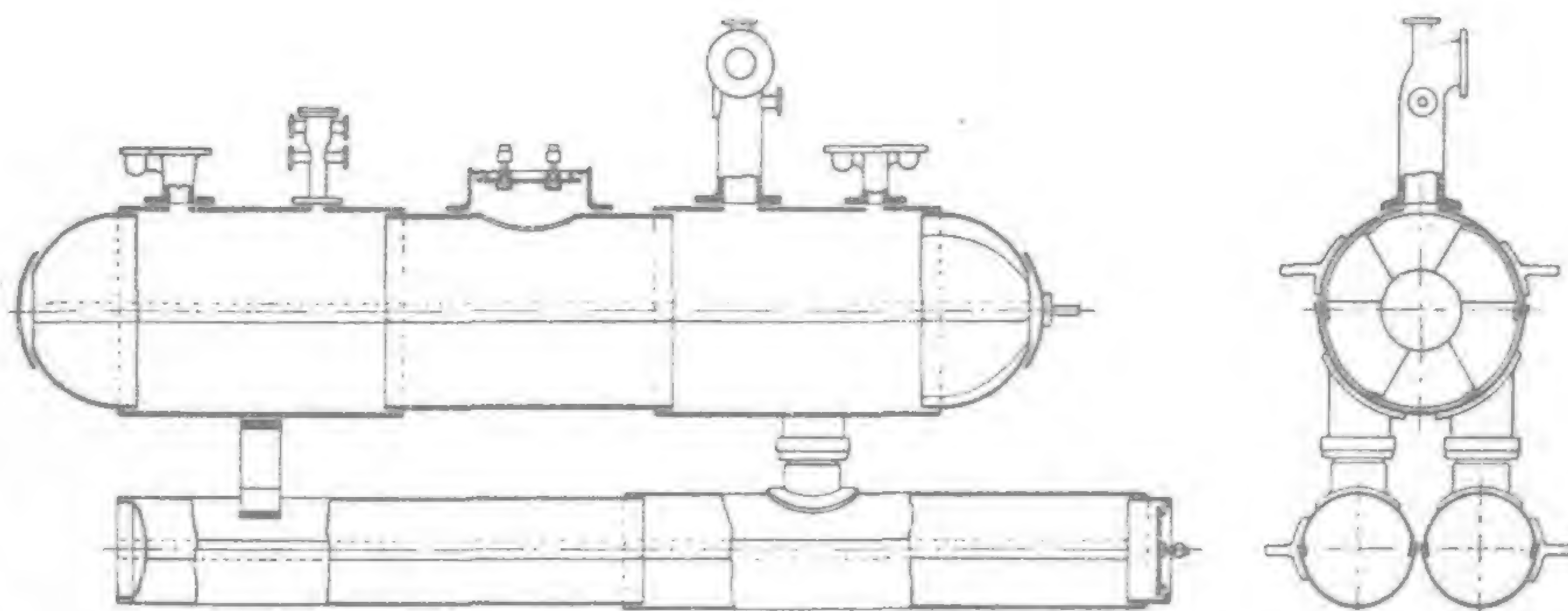
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Engineering Office - 4 Avenue Edward VII

KOBE:
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Engineering Office - 72 Kyo-Machi,

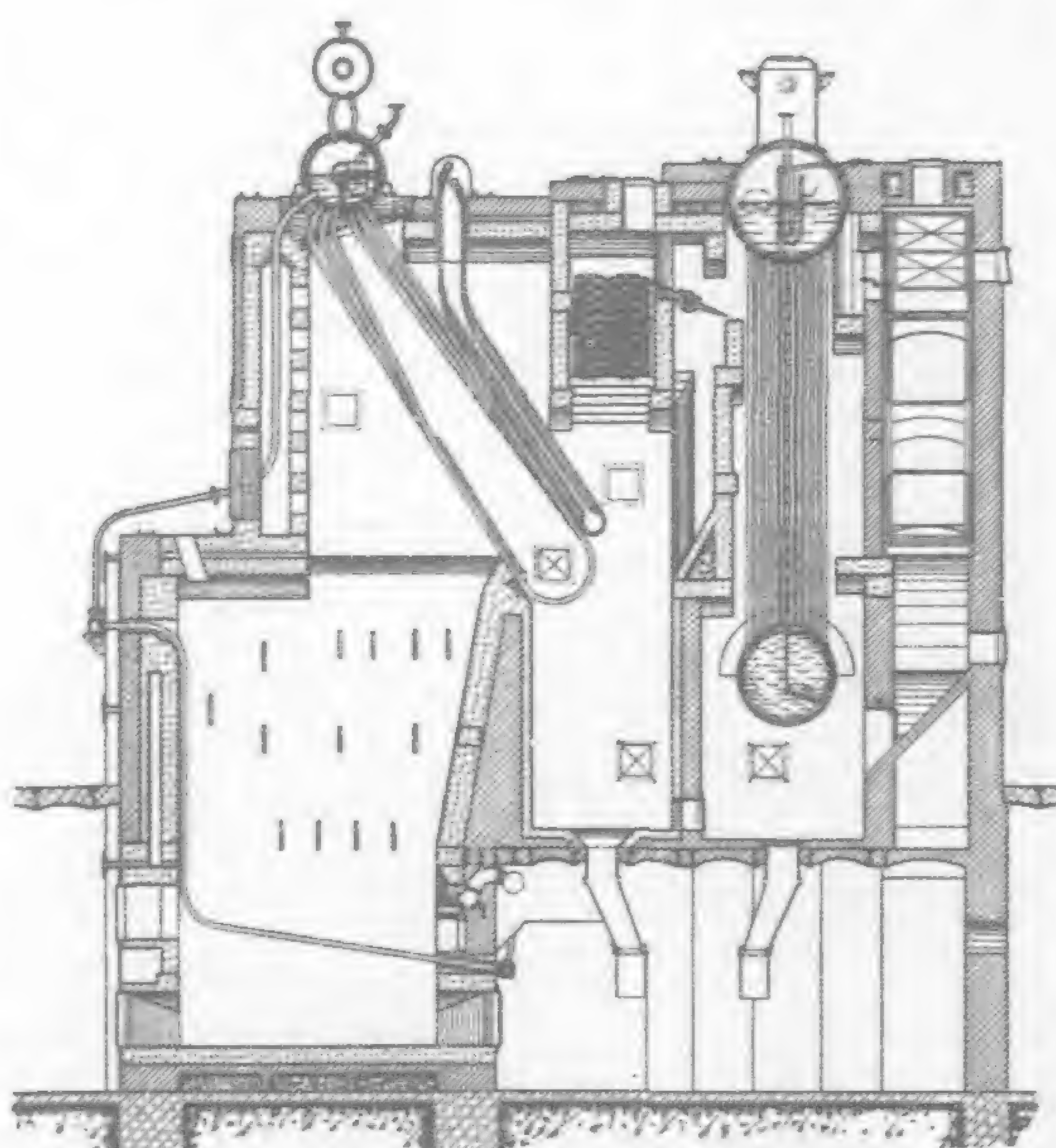
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Sulzer

Steam Boilers

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RESERVE FUND: YEN 12,270,000



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THE LONDON DIRECTORY

with Provincial and Foreign Sections and Trade Headings in Five Languages

enables traders to communicate direct with

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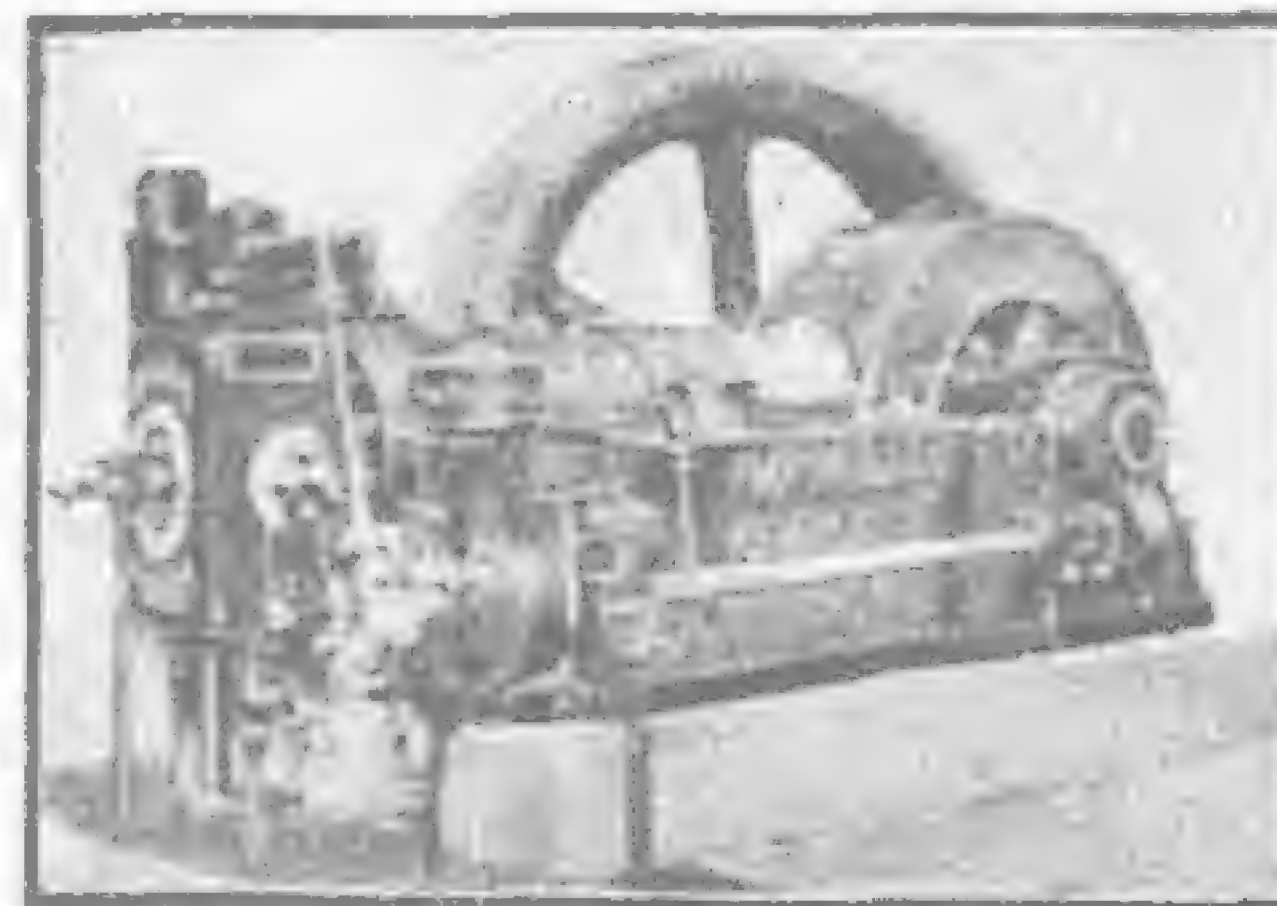
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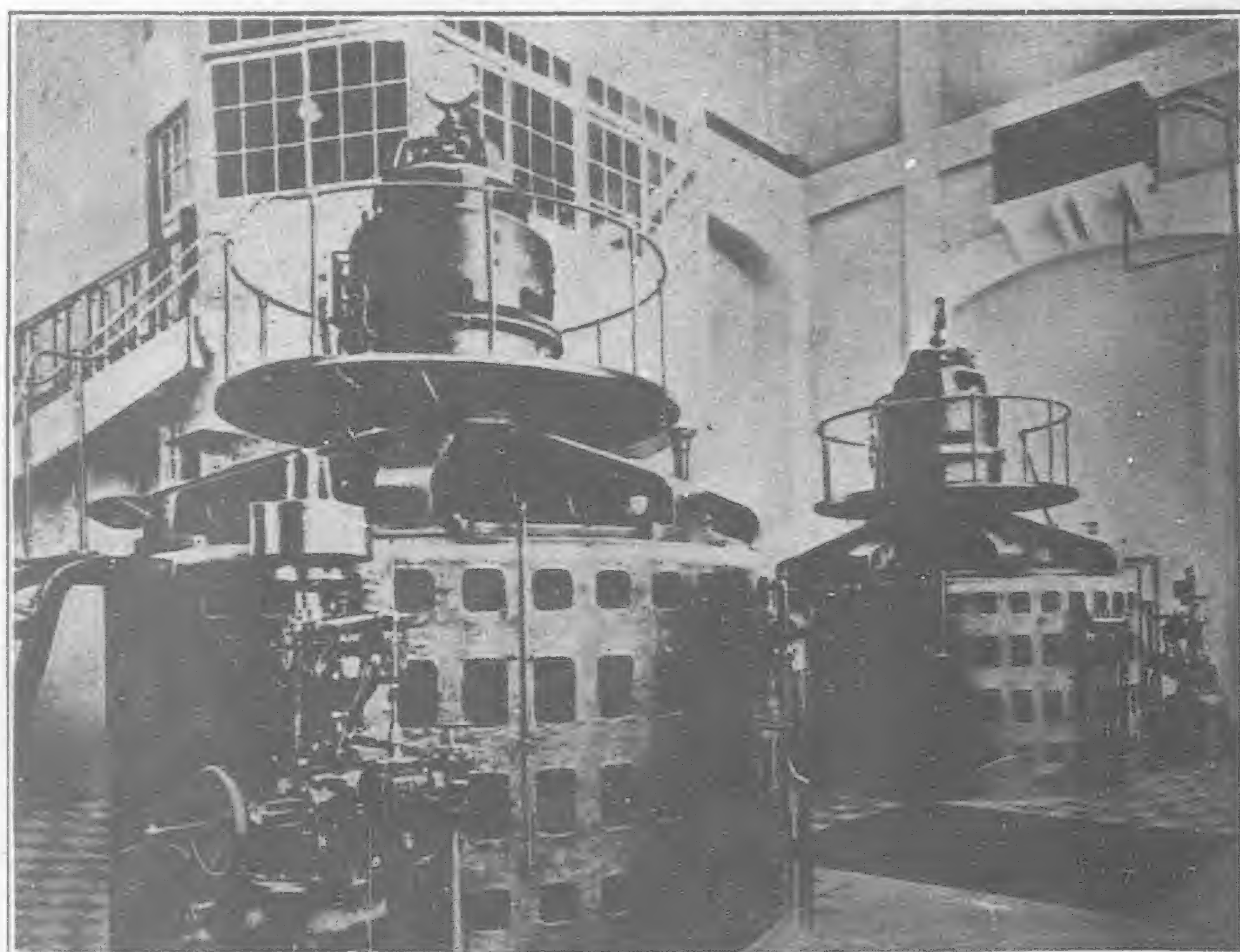
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Established in 1850 as a
Weekly; in 1864 as a daily

To the Reader

The "North-China Daily News" writes the history of China. It records the pulse of its politics; it reports the conditions of its finance and its markets; and it chronicles the daily doings of its people.

To the Advertiser

The greatest purchasing power in China is that possessed by readers of the "North-China Daily News." It is the newspaper which is found in every office, consular or commercial; it is the newspaper most frequently quoted both by the foreign and vernacular press; and it is the one newspaper which combines a quality with a quantity circulation—being the largest both in size and circulation in China. It was the first newspaper to publish audited circulation statements.

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The North-China Herald

Is the weekly edition of the "North-China Daily News" for readers abroad. It contains 95 per cent. of news and is the best medium for keeping in touch with events in China when out of reach of the daily.

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*Copies of either of the above publications
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Telegraphic Address : "Herald Shanghai."—All Codes.

THE

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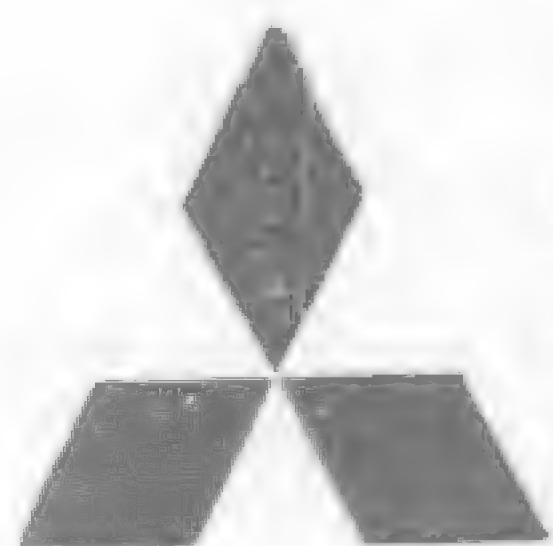
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Head Office: DOJIMA HAMA ORI, OSAKA.

President: FUSAJIRO ABE

OSAKA GODO COTTON SPINNING CO.

ESTABLISHED 1900

Capital	-	-	-	-	-	-	Yen 18,750,000
Capital paid-up	-	-	-	-	-	-	Yen 14,062,500
Reserve and Brought Forward.	-	-	-	-	-	-	Yen 20,429,820

Manufacturers of
COTTON YARNS, GREY and WHITE SHIRTINGS, JEANS
and OTHER COTTON CLOTHS.

Head Office: 2-chome, Dojima-hamadori, Kita-ku, Osaka.

President: F. TANIGUCHI.

FACTORIES: Eight Mills in Japan.

Number of Spindles: Spinning	...	...	...	...	332,480
Twisting	...	...	...	...	57,176
Number of Weaving Machines	...	...	...	...	3,198

JAPANESE TEXTILES FOR EXPORT

DAI NIPPON BOSEKI KAISHA

Established 1889.

Capital Y. 50,000,000

Reserve & Brought For'd. - Y. 46,017,000

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of

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Cloths, Raw Silks and Spun Silks

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Factories:

Fifteen Mills at Home and
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Number of Spindles : Cotton Yarn 993,700

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Number of Weaving Machines: 9,100

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Capital Y. 16,000,000

Capital Paid-Up . . . Y. 13,250,000

Reserve Y. 14,343,206.31

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Head Office

Dojima-kitamachi, Kitaku, OSAKA.

Factories in China:

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Number of Spindles: Spinning 398,176

Twisting 32,340

Number of Weaving Machines: 2,500

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CAPITAL SUBSCRIBED	-	-	-	-	-	-	-	-	-	Yen 150,000,000
CAPITAL (PAID-UP)	-	-	-	-	-	-	-	-	-	„ 92,750,000
RESERVE	-	-	-	-	-	-	-	-	-	„ 56,650,000
DEPOSITS	-	-	-	-	-	-	-	-	-	„ 622,500,000

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(MEMBER OF THE SHANGHAI CHINESE BANKERS' ASSOCIATION)

ESTABLISHED 1908

CAPITAL - - - - - \$2,000,000

RESERVE FUND - - - - - \$820,000

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Capital Paid-up - - - Yen 50,000,000

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Deputy-Governor : S. Suzuki, Esq.

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I. Iuchi, Esq.

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Manchuria—Antung, Mukden, New Town (Mukden), Dairen, Yingkow (Newchwang), Changchun, Harbin, Tiehling, Liaoyang, Ryojun, Kaiyuan, Chengchiatun, Szupingchieh, Fuchiatien, Kirin, Lungchingsun

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Industrial Bank of Japan, Limited

(NIPPON KOGYO GINKO)

Incorporated by Special Charter in 1902 to Encourage Foreign Investments

CAPITAL SUBSCRIBED - - - - - Yen 50,000,000

HEAD OFFICE:

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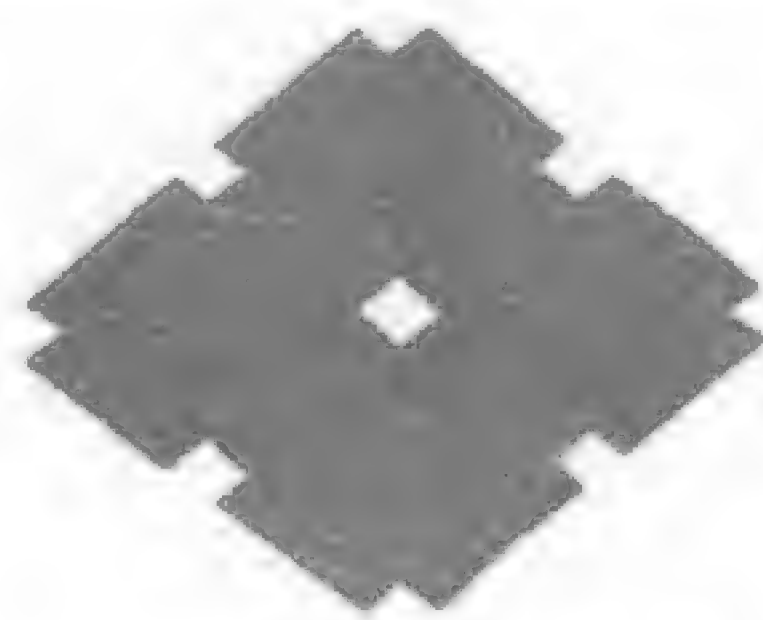
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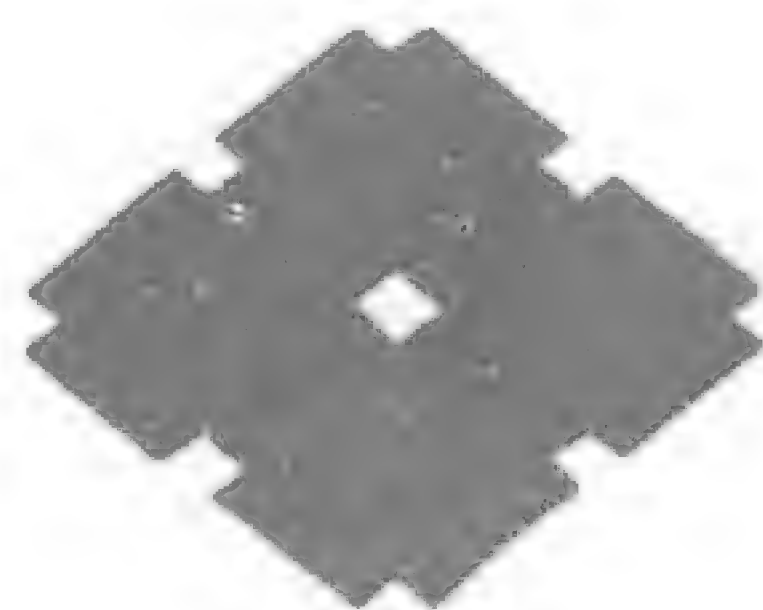
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INCORPORATED: 1912

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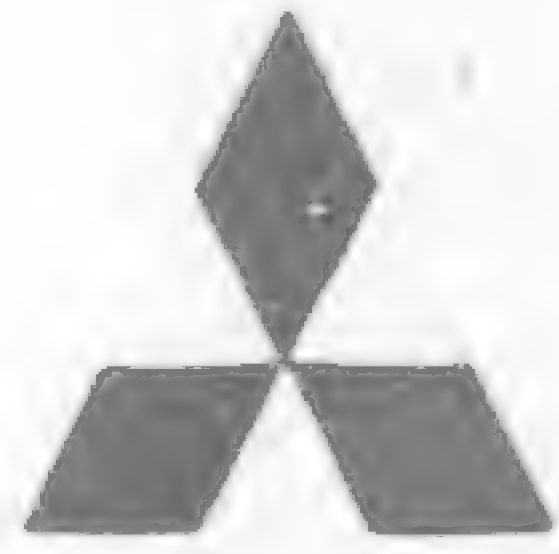
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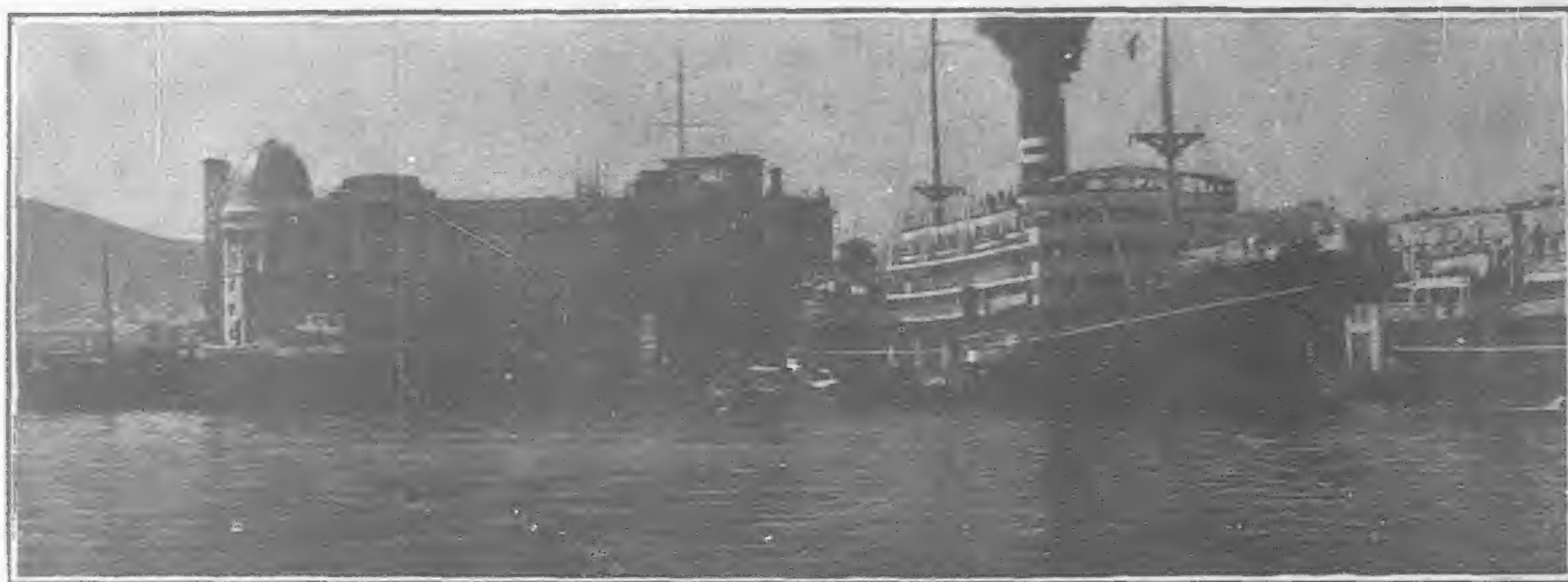
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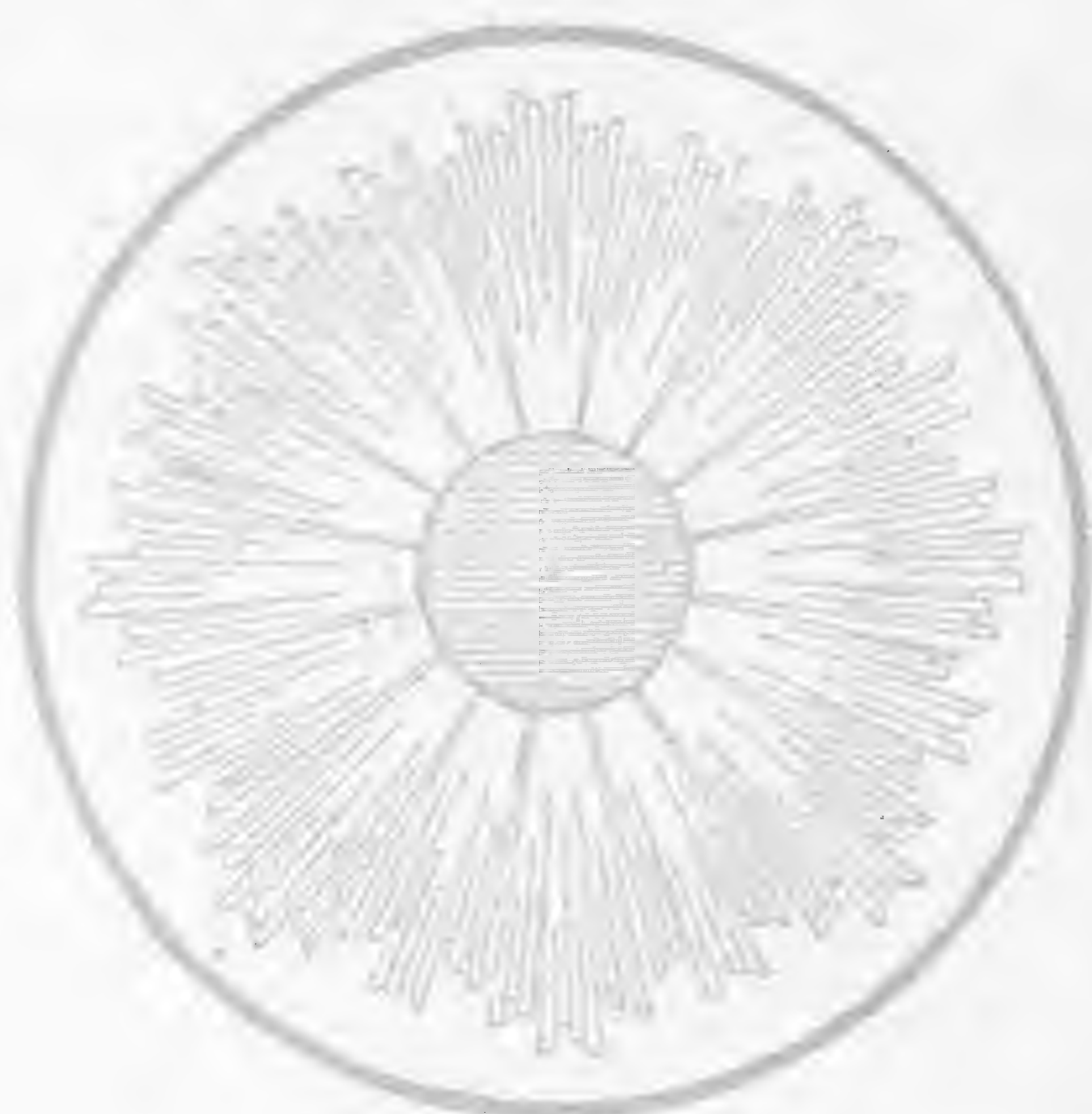
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The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

VOL. XXV

SHANGHAI, JANUARY, 1929

No. 1

Mr. T. V. Soong's Budget Plan

A Momentous Step Forward in China's Finances: Reducing Military Expenses to a Minimum

The Terrific Cost of the Army



R. T. V. Soong, Minister of Finance, has contributed another document to his already numerous important statements on China's finances and their relationship to political conditions. His memorandum on the Budget presented to the Disbandment Conference, lays the basis for the readjustment of national finances.

The Economic Conference faced the problem fundamentally. The bankers, merchants and experts assembled there proposed that the Government should make a loan of \$300,000,000 for the specific purpose of disbanding the troops and that the funds obtained in this manner shall be expended by a citizens' committee. This would have involved turning the surplus troops of the country over to a civilian committee, which would undoubtedly have employed foreign experts to manage the disbandment and colonization and employment of the troops. They further proposed that the cost of the army, navy and air forces should be reduced from the uncertain and enormous amount that is being spent to \$192,000,000.

Mr. Soong is, to a very large extent, morally bound by the decisions of the Economic Conference, as he was responsible for its meeting and pledged himself to carry through its decisions. Furthermore, the Economic Conference insisted upon the preparation of a budget and the installation of a budget system in China so that the people might know what is being spent, how it is being spent, how it is being collected and who gets it. The fact remains, that after the Ministry of Finance has collected the revenues, it hands over a very large percentage of it to the Military Commissariat which distributes it among the generals who may or may not account for it adequately. Whatever accounts have been published have neither been impressive for accuracy and sound methods of accounting nor have they indicated a careful and efficient expenditure of funds.

The Ministry of Finance, then, has no way by which it can control expenditures, except through the budget system and it was hoped that the first important question that would be decided by the Disbandment Conference would be the institution of a budget system and the reduction of military expenses from more than eighty per cent. to something in the region of forty per cent. of the income.

Undoubtedly the most serious problem facing the government is the elimination of corruption, improper administration and chaotic conditions after investigations have been made along modern lines. Even Nanking faces a deficit of approximately \$60,000,000 a year, however, in spite of Mr. Soong's able administration. That deficit has been made up by bond issues and by short term loans. The domestic bond issues sold during the Nationalist régime have netted approximately \$100,000,000.

If Nanking adopts a budget and reduces military expenses and clearly indicates that the proceeds of the bond issue will be utilized for internal reconstruction and not merely to make up military deficits, it is probable that Shanghai can absorb an additional \$20,000,000 or \$30,000,000 immediately and as old issues are amortized new issues could be taken up.

Mr. Soong's Memorandum follows:

The principal objects of the Military Reorganization and Disbandment Conference are to set limits to military expenditure, and to arrange for the disbandment of surplus troops. The problems

involved in attaining these objects are numerous and complicated, with direct bearing on national finances. The effective strength of the nation's military arm will have to be considered by the Conference, but so must we also give due consideration to the existing financial condition of the country. It is for this reason that a brief sketch of the nation's finances is hereby presented.

Let it be said at the outset that it is impossible to furnish accurate and detailed financial statistics for the entire country for reasons that are well known to this conference. We may, however, make use of some general figures, which can be accepted as a basis for our discussion and may be considered as in the main correct.

According to such records as we possess, the total national revenue for the 5th Year of the Republic was \$295,000,000. The total revenue for the 14th Year of the Republic was placed by the Financial Reorganization Commission of that year at \$345,000,000; while the estimated revenue receipts for the 18th year (1929) stand at \$457,000,000. The various national taxes which have lately been classed as provincial revenues, amounting to over 112 millions annually, have been omitted from these estimates.

Of the three figures enumerated above, that estimated for the 18th year, of course, is of chief concern for the Conference. Manifestly the figure should not be taken as final or definite. With the nation's finances still disorganized, and, out of the 22 provinces and the special districts, there being only four provinces—Kiangsu, Chekiang, Anhui, and Kiangsi—that furnish figures which are fairly complete or reliable, it becomes almost impossible to attempt to arrive at more than a fair estimation. Many of the provinces do not furnish any reports at all, and those that do, supply data which is either incomplete or of little use. Working under these difficulties, it is only possible for the Ministry to give approximations, basing its figures on whatever available information that exists, and forming a conclusion thereon. The estimates, therefore, that are given in the Table of Revenue Receipts (appended to the report as submitted) should not be taken as wholly accurate, although they are to the best of our knowledge fairly reliable.

According to Table II, the gross deficit for 1929 will not be less than \$50,000,000, while it is proposed that the military expenditure should be limited to \$192,000,000. But to this must be added the following qualifications:

- (1) With the newly promulgated Customs Tariff going into effect, an increase in Customs receipts may naturally be expected. However, in recent months, there has been considerable dumping on the part of importers in anticipation of the higher tariff. This is evident in the abnormal increases of high grade imports in the last few months as compared with corresponding periods during past years. Hence, when the new Tariff goes into effect in February, the amount of heavier-taxed imports more heavily taxed will be decreased, and a material increase in Customs can hardly be expected. Of course, this will be only a temporary phenomenon, and in time the expected increase will appear, but for the year under consideration the possibility of an increase from Customs revenue must be discounted.

- (2) The estimated revenue from Likin, prior to its abolition, is placed at \$76,000,000. With its imminent abolition and before other suitable tax measures can be effective, there will be a considerable falling off in the Revenue Estimates.
- (3) Redemption of National Loans. The figure of \$155,000,000 as given in Table II, refers to the sinking fund charges of all secured foreign and internal loans. Defaulted loans are not included, and any scheme at meeting their bondholders calls for large additional outlays.
- (4) The figure estimated for Administrative Expenses is \$95,000,000. Of this amount, a considerable portion is associated with the collection of revenue by financial agencies, the administrative expenses of which are deducted directly from revenues collected by such institutions as the Customs Administration, the Salt Administration and the Likin Offices, before they reach the Ministry. (See Table IV).

Limit for Military Charges

The Economic and Financial Conferences held last June, consisting of leading bankers, industrialists, businessmen and financial experts, placed the limits for the annual Military Expenses at \$192,000,000, calculated on the assumption that 50 Army Divisions will be maintained and with allowances for the Navy, Air Forces, Military Academies, Arsenal, central Military administrative expenses, and a military reserve fund of \$12,000,000. This allotment of \$192,000,000 is equivalent to 41 per cent. of the total estimated revenue of \$457,000,000 (See Table VI), or 36 per cent. of the gross expenditures. If, however, from the Revenue Estimates are deducted such necessary expenses as the sinking fund charge for loans and expenses of tax collections, which are first charges on revenue, the proportion occupied by Military Expenses will be raised to 78 per cent. of the Net Revenue!

Complete unification of national revenue is a *sine qua non* for the establishment of a military budget, indeed for anything which we associate with order, system and deliberate planning. The reason is obvious, for once definite sums have been fixed for military expenditures, the Ministry of Finance could not, in any event, fail to make up the sums, but if obstacles are placed in the way of efficient tax collections, it will not be possible to meet such allotments, and the deficit will become insupportable. In suggesting the sum of 192 millions for military expenditure, it was realized at the Economic Conference held last year that although that sum is out of all proportion to the total revenue receipts, and will cause a large deficit; yet it would hardly be practical to disband surplus troops or heavily curtail military expenses all at once. Thus, the delegates were compelled to suggest a temporary solution to secure, on the one hand, the sympathetic support of our military men, and, on the other, to prevent the utter collapse of Government finances. It is further to be considered that the figures for party and administrative expenses are based on past records; and that there is no allowance for the expenditures of the five newly established Yuans of the Government and their subsidiary organizations, since the estimates for these have not been approved by the Budget Committee. Our estimate for such expenses is \$12,000,000 annually, which will further increase the deficit.

It is often said that tax rates in China are not as high as those levied in foreign countries. By raising such rates, therefore, it is argued, the national revenue will be correspondingly increased. Unfortunately, this cannot be applied to present-day China. For many years this country has witnessed incessant warfare accompanied by droughts, famines and other catastrophes, and it will be difficult to justify any substantial increase in tax rates. Rather, the essential thing now in national finances lies in the reorganization of existing taxes, and the centralization of financial control. Such proposed taxes as Income Tax and Inheritance Tax even if put into effect at once cannot be expected to yield fruit for many years to come.

What has so far been proposed in this Memorandum presupposes that financial unification will be achieved. If we are to face existing conditions we find that facts are quite otherwise and there is chaos in national finances. There is to-day little if any improvement from conditions existing during the period of warfare. Thus, the national revenues from such provinces as Hunan, Hupeh, Kuangtung, Kuangsi, Shensi, Kansu, Honan, Shansi, and Suiyuan, —not to mention those from the Three Eastern Provinces, Szechuen,

Yunnan, and Kueichow, are entirely appropriated by the localities mentioned. In the provinces of Hopei (Chihli) Shantung, and Fukien, the revenue officials are at least commissioned by the Central Government, but in other provinces they are appointed by local and military authorities and most of them, fail even to render accounts.

At present the Central Government derives its revenues from only four provinces, namely: Kiangsu, Chekiang, Anhui, and Kiangsi. The receipts of Kiangsi are hardly sufficient to meet its military expenditures, while that of Anhui is in a like position. The chief source of revenue of the Central Government is thus practically confined to Kiangsu and Chekiang. And although these two provinces are regarded as very prosperous, owing to military conflicts during the past two years and the establishment of the Central Government with its multifarious organs in their midst, the drain on them has been altogether too great. In order to meet the urgent administrative and military expenditures the main sources of revenue, such as the 2½ per cent. Surtax, the Tobacco Tax, the Stamp Tax, etc. have been pledged for the service of various loans. With the success of the Northern Expedition in mid-summer, it was hoped that speedy readjustment would be made and the burdens lightened. But for various reasons, these matters have been postponed until to-day, when the National Military Reorganization and Disbandment Conference is in session.

During the past six months, not only was it impossible to reduce the military expenditures to any appreciable extent, but administrative expenditures have been ever increasing. With only the limited revenues of the four provinces, and without assistance from other sections, the Central Government during the last six months was severely tried by the difficulty of making both ends meet. Hence it has resorted to further loans and bond issues, secured on the Petroleum Tax, Wheat and Flour Tax, and the increased Salt Tax. So it comes that of the total receipts of the Government for the half year from June to November, 1928, 45 per cent. comes from such loans and bond flotations, while only 55 per cent. were from revenues.

How long can the Government maintain this hand-to-mouth policy? It is time that the finances of the country be centralized and reorganized, otherwise only bankruptcy can result. The hope of borrowing from abroad for current expenditure must, at least for the immediate future, be regarded as illusory, as many of the overdue foreign loans have not been taken care of. Our banks and the public may continue to subscribe to Government loans but the available securities of the Government will soon come to an end, and the public have already absorbed securities too freely. The recent financial panic in the North is a warning sign, and although that was a direct heritage from the past and in no way due to the operations of the National Government, yet if we were to continue to depend on borrowing even the strongest banks will be faced by financial difficulties, and the future of all Chinese financial institutions will be placed in great jeopardy.

The trials of national finances are indeed great, and the various sections that are not under the direct control of the Ministry of Finance are faced by similar if not greater difficulties. Something must be done, otherwise there will be no hope for maintaining even the present highly unsatisfactory situation, not to say of reconstruction or educational improvements.

Indispensable Reforms

I am sure the members of the Conference have fully realized the seriousness of the situation and will do their utmost to remedy it. Two basic steps must be taken:

- (1) the military expenditure must be strictly limited, and
- (2) the national finance must be centralized and reorganized.

I have already indicated to what extent we could safely allow military expenditures to go and as regards the unification of the national finances, there are three essential points:

- (1) The Ministry of Finance must have complete control over the administration of national revenues, and must not be interfered with in any way by the military authorities.
- (2) The Ministry of Finance must have full power to appoint and dismiss financial officials. In appointing the various officials, only the best and most qualified men will be selected; sectionalism and prejudice will not be tolerated, If the authorities of the different provinces at any time

voice dissatisfaction over any of the officials appointed by the Central Government as being incompetent or dishonest, their obvious recourse is to draw the attention of the government and the grievance could be settled by due process of law.

- (3) The different civil authorities in the provinces must not interfere with any proceeds of the national taxes or levy surtaxes thereon so that the Government can freely collect or dispose of the national funds according to the best advantage.

Assuming now that national finances could be unified and reorganized, there are still tremendous difficulties before the Ministry of Finance, although these are transient. The deficit of 60 million dollars in the budget estimates has to be reckoned with. Further funds will have to be raised for the disbandment of troops over and above the current military expenditures. At the same time, the Ministry will be immediately faced by the facts that the lunar New Year is approaching and that the first and second months, according to the old calendar, are always slack months, and the collections in those two months normally amount to only the receipts of an ordinary month. Moreover, the important national taxes have already been pledged as securities for loans, not to mention the increase of administrative expenditures and the necessity of funds for meeting the unsecured domestic and foreign loans.

We realize that the higher military commands will experience great difficulty in reducing their expenses, but the Government's burden in tiding over the coming year will be even greater. In spite of that, however, we feel that if a free hand is given to the Ministry in all matters related to finance, we can and will overcome all obstacles.

With financial control unified and reorganized the present tax system can be effectively improved so that the burden of taxation will fall upon the people more equitably than at present. Smuggling and other evils can be easily dealt with, the collecting offices more efficiently administered, with very gratifying increase in revenue. To show that this is not mere theorizing we can take the example of Kwangtung, which under the Nationalist Government, increased its receipts from \$20,000,000 to more than \$100,000,000 in 1926. The one and only secret of success was real, effective, unquestioned unification of finances, and as a prescriptive on a national scale it will be just as potent.

We are certain that after the unification of finances, it will not be difficult for the national revenue to increase by one-third in a year's time and the estimated deficits of fifty million will thus be overcome in the next year. It is quite possible that in two years the national revenue can be doubled, without undue hardship to the people. The Treasury will then be strong and general confidence augmented. With such conditions, constructive and educational measures can be really embarked upon, while the general industrial and commercial development will increase by leaps and bounds. But prospects, however alluring, can be realized only after an intervening period of privations and sacrifice.

Five Concrete Proposals

As the future of our Party and of our country depends so much upon the unification of financial control, the Ministry of Finance wishes to place before the Conference the following proposals:

- (1) That all national taxes shall be collected only by the agents of the Ministry of Finance, and the military and local authorities shall be strictly forbidden to detain any portion or impose surtaxes on any pretext whatever.
- (2) That the Ministry of Finance shall have undivided control over the appointment of financial officers, and the administrative policy.
- (3) That provincial and railway subsidies to the different armies shall now be remitted to the National Treasury, which shall be responsible for payment of all military expenses.
- (4) That all provincial gendarmerie or peace preservation soldiery shall be paid out of provincial revenues.
- (5) That this Conference shall definitely apportion the military allowance among the different military units, and prescribe in detail the procedure of payment to each of the units, which should be followed by the Ministry of Finance.

When this plan is fully worked out it shall be submitted to the Government for approval and promulgation as law to be strictly observed by the Military authorities and the Ministry of Finance.

If the five conditions are accepted and put into effect, the Ministry of Finance will be ready to meet regularly and without fail at due dates the annual military expenditure of \$192,000,000 in addition to reasonable disbandment expenses. If not, the future is dark indeed.

TABLE I.

Year	Salt	Customs	(Unit \$)		Comparison in %
			Likin	Wine and Tobacco	
1916 ...	84,771,000	72,346,000	75,314,000	27,843,000	100%
1925 ...	98,859,000	120,365,000	51,348,000	40,730,000	116%
1929 ...	116,570,000	192,350,000	76,280,000	47,040,000	154%

Year	Stamp	Miscellaneous	Total	Comparison in %
1916 ...	5,671,000	29,950,000	295,895,000	100%
1925 ...	5,864,000	28,567,000	345,753,000	116%
1929 ...	12,930,000	12,570,000	457,740,000	154%

APPENDIX TO TABLE I.

Originally classed as National Revenue and now classed as Provincial Revenue in accordance with Dr. Sun's Policy.

Land Tax	...	...	...	90,081,000
Deeds Tax	...	...	...	14,787,000
Special Business Tax	...	...	...	2,521,000
Pawn Shop Tax	...	...	...	732,000
Animal Tax	...	...	...	638,000
Butcher Tax	...	...	...	3,623,000
Boat Tax	...	...	...	49,000
				\$112,431,000

TABLE II.

Rough Estimates of National Revenue and Expenditure for 1928.

Receipts.				
Salt Tax	...	...	...	116,570,000
Customs Duties	...	...	...	192,330,000
Likin	...	...	...	76,280,000
Wine and Tobacco Tax	...	...	...	47,040,000
Stamp Tax	...	...	...	12,930,000
Miscellaneous	...	...	...	12,570,000
				457,740,000
Deficit	...	...	...	50,130,000
				\$507,870,000

Expenditure.				
Party Expenses	...	...	...	4,800,000
Civil Expenses	...	...	...	95,420,000
Military Expenses	...	...	...	192,000,000
*Local Withdrawals	...	...	...	41,430,000
Loan Service	...	...	...	155,790,000
Miscellaneous	...	...	...	18,430,000
				\$507,870,000

*National Revenue retained and likely to continue to be retained by the Provincial Government of Yunnan, Kweichow, Szechuen, Sinkiang, etc.

NOTE.—Expenses for the five Yuans, estimated at \$12,000,000 a year have not been included in the above, inasmuch as they have not been passed by the Budget Committee.

Representation of Army Expenditure in proportion to Gross Expenditure.

China 36%, Japan 9%, England 5%, America 8%, France 14%.

TABLE III.

Net Monthly National Revenue According to Provinces as Estimated by Delegates to the Financial Conference held in Nanking, July 1, 1928.

Kwangtung—Kwangsi	...	...	...	5,000,000
Hunan—Hupeh	...	...	...	4,000,000
Kiangsu—Chekiang—Anhui	...	...	...	5,000,000
Kiangsi	...	...	...	1,000,000
Fukien	...	...	...	500,000
Shantung	...	...	...	1,000,000
Honan	...	...	...	400,000
Hepei...	...	...	...	2,500,000
Shensi	...	...	...	300,000
Shansi	...	...	...	600,000
Total	...	...	...	\$20,300,000

Estimates submitted by:

Hsueh Tuh-pei	(II Army Group)
Pei Chi-kun	(IV Army Group)
T. V. Soong	Chairman
Chang Shou-yung	Vice-Minister of Finance
Ho Ying-ching	(I Army Group)
Li Hung-wen	(III Army Group)
Hsiung Bin	Chief of Military Accounts
Liu Chi-wen	Quartermaster General

NOTE.—If the special taxes and gambling revenues of Kwangtung are deducted from the above figures, the receipts will be reduced by three millions.

TABLE IV.

Expenses of the Various Financial Administrations.

1. Maritime Customs	...	...	...	18,598,180
Native Customs	...	...	...	2,688,478
Surtax Bureaux	...	...	...	1,582,212
				22,868,870
2. Salt Administration	...	...	...	17,299,471
3. Likin Administration	...	...	...	9,000,000
4. Expenses of Organs under the direct control of the Ministry of Finance				
A. Expenses of Chekiang, Kiangsu and Anhui (Salt and Customs Administrations excluded...				5,765,000
B. Expenses of the Ministry of Finance	...			1,742,148
				\$56,675,489

TABLE V.

Army Expenditure of the Leading Countries.

<i>Original Currency</i>		<i>In Chinese Currency</i>	<i>% of National Total Expenditure</i>	<i>Monthly Expenditure Chinese Currency</i>
China ...	M \$186,000,000	186,000,000	36%	15,500,000
Japan ...	Y. 173,614,000	173,614,000	9%	14,467,000
England...	£41,565,000	415,650,000	5%	34,637,000
U. S. ...	\$285,000,000	570,000,000	8%	47,500,000
France ...	Fr. 6,030,566,000	482,445,000	14%	40,203,000

China's Trade Mark Law

Order No. 170 issued by Ministry of Labor and Commerce of the National Government

Translated by N. F. Allman

"Provisional Regulations concerning the examination of Certificates of Registration of Trade Marks (eight articles in all) are hereby promulgated."

H. H. KUNG (Seal)
Minister of Labor and Commerce.

PROVISIONAL REGULATIONS CONCERNING EXAMINATION OF TRADE MARK REGISTRATION CERTIFICATES.

ARTICLE 1.—All the original certificates of registration of trade marks registered at the Peking Trade Mark Bureau prior to May 1927, (except in cases where certificates of re-registration have already been obtained from the National Registration Bureau), shall be forwarded to the National Trade Mark Bureau for examination within six months from date of promulgation of this Regulation.

The examination fee is \$10.00 and shall be paid on filing the application. For associated trade marks, the fee is half the above.

ARTICLE 2.—The certificate of registration after being examined, recorded in the registration books, and published in the "Trade Mark Gazette" shall be indorsed and sealed by the National Trade Mark Bureau and returned to the applicant.

ARTICLE 3.—Any trade mark registration certificate which has been examined in accordance with the provisions of Art. 1 of this Regulation may be exchanged for a new certificate on the applicant's request, but in such cases an additional fee of \$2.00 and \$1.00 stamp tax shall be paid.

ARTICLE 4.—Should any trade mark, under examination, be similar to any trade mark registered at the National Registration Bureau the applicant may, after the consideration thereof by the National Trade Mark Bureau, apply for investigation of said trade

mark so registered at the National Registration Bureau in accordance with the provisions of Sections 1 and 3 of Article 28 of the Trade Mark Law.

ARTICLE 5.—Anyone holding a certificate of Approval issued by the Peking Trade Mark Bureau prior to May, 1927, may within six months from date of promulgation hereof, apply for re-affirmation thereof in accordance with the procedure laid down in Sec. 2, Art. 26 of the Trade Mark Law and have same published in the "Gazette" and approved. The above application shall be accompanied by one quarter of the registration fees together with the application fee as required by Sec. 1, Art. 34, and Sec. 1, Art. 35 of the Detailed Trade Mark Regulations.

ARTICLE 6.—Should any trade mark set forth in a certificate of approval be found, on consideration of an application for re-affirmation filed in accordance with the provisions of Art. 5 of this Regulation, to be similar to a trade mark registered at the National Registration Bureau, the said application may be rejected and the one quarter registration fee so paid shall be returned.

The applicant may, however, apply for re-hearing of said order of rejection in accordance with Article 27 of the Trade Mark Law.

ARTICLE 7.—All certificates of registration and certificates of approval issued by the Peking Trade Mark Bureau subsequent to May 1, 1927, are null and void; except that such certificates of registration or certificates of approval issued by the Peking Trade Mark Bureau to factories or head offices of firms in Ho Peh, Shantung, Manchuria, Chahar, Suiyuan, Jehol, and Peking, etc. prior to the time these places were brought under the jurisdiction of the National Government, shall be dealt with according to the provisions of this Regulation.

ARTICLE 8.—This Regulation shall be effective from date of promulgation.

China's Railway Rehabilitation

Mr. Sun Fo's Efforts to Create a Modern Railway Service; Policies Authoritatively Described New Rolling Stock for the Shanghai-Nanking Railway

UNDER the ministry of Mr. Sun Fo, China's railways are rapidly being placed upon a sound footing. The problem seemed to afford no solution a few months ago; the militarists held all the lines; the revenues were being squandered; rolling stock was lacking and the little that remained was horribly out of condition. Yet, Mr. Sun and his associates have faced the problem with courage and energy and are restoring the roads with a businesslike capacity for hard work and concentration on the main task, unusual in Government circles.

There are many who would have China start on numerous new projects immediately. But the Ministry of Railways has apparently adopted a program of rehabilitation first. Get the existing lines in working condition before anything is done to start new lines! This attitude and the workmanlike procedure of Mr. Sun Fo and his associates has created a confidence, far beyond anything felt in the general situation. This confidence has already expressed itself in the exceptional financial transaction in the course of which a Shanghai firm of brokers took Gold \$2,000,000 of Belgian Boxer Indemnity Six Per Cent Gold Bonds at 84 from the Ministry and its fiscal agent in the transaction, the Belgian Bank. The total amount of this issue made available for purchase was Gold \$4,000,000,000 and it was all taken up within 48 hours, and all of it is to be used for the purpose of rehabilitating the railways.

The increased earnings of the Shanghai-Nanking Railway which is directly managed by the Ministry of Railways, through its Director of the Bureau of Administration, Mr. Choy Ju-kee, afford as astonishing evidence of the value of Chinese railways, if the management is efficient and honest and when there is no interference by the militarists.

The Policy of the Ministry of Railways

The creation of a separate ministry to administer the Chinese Government railways early this fall was a distinct manifestation of the will of the country to reconstruct herself during this political tutelage period. The programme before the Ministry of Railways can be resolved into two principal parts: first, the rehabilitation of the existing railways through the retrenchment of the working forces and adjustments in securing efficiency of management and independence of finance; and, second, the construction of new lines up to the mileage as pronounced by the late Sun Yat Sen.

One striking instance of attempts at rehabilitation is the direct operation of the Shanghai-Nanking and Shanghai-Hangchow-Ningpo Railways by the Administration Department of the Ministry. No small amount of savings was effected through the reduction of the personnel, about thirty useless positions having been abolished. Likewise, more publicity has been given to the purchase of stores. Through well organized bidding, the lines are now purchasing coal, for instance, at a little over \$13 a ton, as compared with the exorbitant price of \$16.50 hitherto paid, thus saving the cost of about 350 tons per day.

Further improvements in the two lines, by way of facilitating traffic, found expression in the resolutions passed pertaining to the apportionment of a part of the private cars for the use of ordinary passengers and the reservation of berths by government officials. Of the twelve cars formerly commandeered, all but one have been returned.

The replenishment of rolling stock is being carried on in other railways as well. Only recently the Ministry arranged a Mex. \$1,000,000 credit with the Belgian Bank for the purchase of two passenger trains costing \$800,000 and forty 40-ton goods wagons at a cost of \$200,000 for the Tientsin-Pukow Railway.

The other principle enunciated by the Ministry is that railway funds shall be kept separate and distinct, and should be divorced from political or military appropriations detrimental to the financial policy of the different railways. A study of all the existing Loan

Agreements is under way. The Ministry will undertake to recognize and to meet the old obligations, as circumstances warrant.

For the completion of existing railways and the construction of new lines, a Bureau of Engineering has been formed, which has for its task the surveying, planning, and construction of intended projects.

At the first Meeting of the Advisory Committee on Fares, Rates and Classification of goods, Mr. J. K. Choy, Director of the Administrative Bureau presided. The following is a summary of the discussion.

It was explained that up to the present transportation on the railways had been governed by the regulations issued on the authority of the late Minister of Communications, and these had taken the place of transportation law. Now that China was working out a code of law based on western models, it was necessary that provisions regarding the duties of transport undertakings such as railways, should be included.

Transportation law has two phases; the first, the rights and duties of the railways as members of the community. Second, their rights and duties in performing transportation under transportation contracts.

On the suggestions of the Chairman, the meeting first considered whether it was time for the drafting of such a law, and how far the railways would be able to live up to its provisions if it were drafted. It was the opinion of the meeting that the time had come when the railways should abandon the autocratic attitude they had adopted in the past and face their responsibility to the community. They should, therefore, be prepared to adopt what is known in British law "Bailee's responsibility," by which they would be responsible for any consequences which arose from wilful misconduct and gross negligence on their part in carrying out the transportation of passengers and goods. This would be their responsibility as part of the community *vis-a-vis* other members of the community. This should be the principle of any transportation law to be embodied in the code of laws of the country.

The next point in connection with transportation law was the position of the railways as regards the transportation contract. The various kinds of risks incidental to transportation were considered, and it was agreed that, subject to the provisions of the general law of the country, as suggested above, risks arising from *force majeure*, the nature of the goods transported, the action of outside authorities, or the action of the owner of the goods should not be placed at the responsibility of the railways in the transportation contract. In the case of ordinary risks arising from transport, such as accident to trains, fire and the like, which are misfortunes both to the railways and the owners of the goods, it was considered that the proper course was to have such risks covered by insurance. It was also decided that in making the draft of transportation law, the general principles only should be laid down at present, leaving to the experience of the future the elaboration of the law, so that it would mould itself to the requirements of the country. In regard to the question of insurance, it was noted that in the present state of the railways it would be found difficult to introduce that generally, but that its introduction would have to be gradual,—first on the railways which would be able to live up to the responsibilities, and then extending it later to other railways as they were brought into a condition to undertake it. The responsibility under the general law of the country should however be adopted by all railways at once. A committee was then appointed to make a draft of the law required.

Passenger Fares

The meeting then took up the discussion of passenger fares, and the possibility of having a basic rate the same for all railways was considered. In the course of the discussion it was brought out that in certain districts where there was competition between

the railways and other means of transportation, the railways had to adopt a low basic rate for their fares, while in other districts where competition was absent the railways could apply higher basic rates fixed to accord with the conditions obtaining in their territories. The meeting finally decided to record its opinion that, while a basic rate the same for all railways was desirable, it was impossible of attainment because of the competitive reasons referred to, and also because of the diverse conditions obtaining in different parts of such a vast country as China. Each railway should therefore be allowed, subject to the approval of the Ministry of Railways, to fix the basic rates for its passenger fares and the Ministry, in examining the basic rates as proposed by each railway, should follow the policy of unifying these in the case of two or more railways when this can possibly be done, thus attaining a certain amount of regional unification.

In regard to the proportion to be observed between the first, second and third class fares it was reported that the proportion between the fares for the different classes now in use was, generally speaking, two times the third class for the second class, and three times the third class for the first class. However some railways could not observe these proportions exactly, because for competitive reasons their third class fares were fixed on a low basis, for example, the Shanghai-Nanking Railway. In the case of that line its first class fare had to be made four times the third class fare otherwise it would be too low, and even with that it was still somewhat below the level of other railways.

It was agreed that as far as possible the proportion of one, two and three between the first, second and third class fares should be observed, but that the Ministry could authorize exceptions where it was found necessary.

In regard to the question whether the fare tables should be tapering ones or at a flat rate for the whole distance, it was pointed out that in the case of goods traffic the railways gave a reduction based on distance. The reasons for this were that in the case of goods it was to the advantage of the railways to have long hauls as they could get better use of the rolling stock. In the case of passengers, the railways had to provide the trains anyway, and so long as they could fill them, there was no reason for them to encourage long distance travel by giving a reduction, besides passengers who travel long distances could generally afford the full fares.

With reference to the Passenger Traffic Regulations it was pointed out that the form of the transportation law would exercise an effect on the way in which these regulations would be drawn up and until that was decided, consideration of the matter should be deferred. The question of the parcels rates was brought up, and as the regulations contended for other matters relating to rates it was considered best to have them examined by a small committee.

Goods Rates

The question of the goods rates were then taken up. As regard the matter of having basic rates the same for all railways, it was found that the same considerations as applied to passenger fares applied to the goods rates. The meeting therefore, resolved that its recommendation on passenger fares should apply to goods rates as well.

The question whether the present system of carload, ton and fifty kilogramme rates should be maintained or whether a system of two rates, one for carload and the other for less than carload should be adopted was then discussed. It was pointed out that when the Chinese railways revised their rate system and adopted the metric system some years ago, it was then decided that in addition to the carload rate, two additional rates, one for goods in ton loads and another for goods in small quantities should be arranged. The reason for this was that goods conveyed in less than carload entailed a certain loss in car space, and more handling than if the goods were sent in full carloads. Consequently the railways should be paid for the conveyance at a higher rate to compensate them for this. Unfortunately the railways had been allowed to fix their rates in such a manner that the proportion between the carload rate and the two other rates were too great, in some cases as high as 100 per cent. It had been found that this had greatly contributed to the development of transportation companies, as these companies could take goods from merchants in small quantities, and charge the merchants the rates of the railway for less than carload, and hold the goods until they had collected a full carload, and then ship them

over the railways at the carload rate, thus making a handsome profit. While it was recognized that it was to the advantage of the railways to have goods sent in carloads, it was not to the advantage of either the railway or the public that transportation companies should be allowed to make such large profits. The railway should therefore, examine the whole question and fix their rates for less than carload quantities at a percentage higher than their carload rates, sufficient only to compensate them for the loss of car space and extra labor in handling the goods. The exact proportion between the two rates would have to be carefully worked out. The meeting approved that there should be only two rates, and referred the question of proportion between them to be examined by the small committee appointed to deal with the Passenger Traffic Regulations.

The question of the calculation of the tapering rates was then taken up, and the various methods in use on the railways in applying the taper were explained. It was agreed that the small committee above referred to should deal with the question, and work out a uniform method.

The question of the principles to be observed in the making of special rates was also referred to the small committee. In regard to the unification of the handling and other terminal charges, a considerable discussion took place in which reference was made, to the different rates and conditions of labor at different places, and the difficulty of dealing with laborers who in certain cases insisted in collecting the whole of the handling charges themselves. It was agreed that a uniform rate for handling charges, also to include other terminal expenses, such as storage, police supervision and the like, and to be known as "charges for extra services rendered by the railways" should be worked out, and the small committee was entrusted to attend to this, and to report to a later meeting.

The Goods Traffic Regulations were also left to be reviewed by the small committee.

With regard to the questions relating to the classification of goods, a draft commodity group index was presented to the meeting. It was explained that this index had been drawn up to follow in general the Chinese system of indexing which was by the nature of the products. It was proposed to make this system a standard one for the publication of the classifications in various languages. In addition it was intended, if the system of group commodity indexing were adopted for the classification, to arrange for the commodity statistics to be kept by groups corresponding to the index, so that information would always be available in dealing with questions of rates in an intelligent manner. The meeting approved the principle, and it was left to Mr. Lockhart to complete the work, and submit it to a later meeting of the committee. The committee also agreed to recommend that the classifications drawn up on the lines suggested should be published in Chinese, English and French.

The small committee, referred to above, was entrusted with the duty of working out the method to be employed in investigation in commodities for purposes of classification, and also with the working out of the exact definitions to be used in the sub-classification of various articles.

The Financial Condition of the Shanghai-Nanking Railway

The year 1929 bids fair to be one of the most prosperous years in the history of the Shanghai-Nanking Railway so far as its financial possibilities are concerned.

According to latest reports from the Railway, the approximate cash balance at the end of this June, calculated on the basis of the preceding year, is in the neighborhood of \$1,098,000 and at the end of this year \$3,069,000, assuming that the earnings for the first period average \$28,000 a day and for the latter period \$30,000, and that the saving on coal through reduction in price is about \$300,000 for the whole year.

Out of the total cash balance of \$3,069,000, \$1,000,000 is due for capital expenditure covering the last four years, in accordance with the 1924 Agreement which provided \$250,000 a year for such purpose. An amount of \$1,247,000 should also be set aside for meeting amortization charges. After deducting another sum of \$520,000 (taken from last year's total), as allowance for unpaid military traffic, and making provision for capital funds and amortization charges above-mentioned, there should remain a net cash balance of about \$300,000.

The Railway has the potentiality of making handsome earnings, as a result of the recovery of peaceful conditions throughout the regions through which it traverses, and the choice of Nanking as the National Capital. From the earnings alone, new additional rolling stock may be purchased to meet the increasing volume of traffic, both passenger and goods—the expanding traffic with the new capital and the heavy goods traffic of the Tientsin-Pukow Railway when it begins operations.

Half of the amount of capital funds—\$500,000—may be utilized for uncompleted work, urgent capital works, and the Sentinel coaches already purchased. The other half may be devoted to the acquisition of passenger engines, coach underframes, goods engines and wagons, costing in all a total of \$1,500,000, the balance short to be made up from earnings of the additional stock in two years.

In short, the financial prospects of the Shanghai-Nanking Railway are excellent and the figures given conservative and reasonable. The proposals for the acquisition of additional rolling

stock which allow of much needed expansion are decidedly favorable to bondholders.

Contract Placed for Five "Sentinel" Coaches

To relieve the existing rolling stock for main line traffic, the S.N.R. has recently ordered through Messrs. Scott, Harding & Company of Shanghai five gear-driven double articulated rail cars of the "Sentinel-Cammell" type, the joint product of the Sentinel Waggon Works, Ltd. and Cammell, Laird & Co., Ltd.

The allocation of the £150,000 capital expenditure is to be employed to purchase through the British and Chinese Corporation the following additional rolling stock: 3 passenger locomotives, £27,000; 24 Coach Underframes, £19,200; Body-building at the Woosung Works, £26,000; Electric Light Equipment, £5,500; 6 Goods Engines, £54,000; 35 Steel Covered 40-ton Goods Wagons, £17,600.

The purchase of the five "Sentinel" Coaches will release two engines and one local train for Main line service.

Estimated Cost of New Rolling Stocks and Materials for Repairs on Chinese Government Railways

(Compiled by the Ministry of Railways, Nanking)

ESTIMATED COST OF ROLLING STOCKS

NAME OF RAILWAYS	New Locomotives			New Coaches			New Wagons		
	No. Required	Unit Cost	Total Cost	No. Required	Unit Cost	Total Cost	No. Required	Unit Cost	Total Cost
Canton-Hankow Railway, Canton Section	4	\$90,000	\$360,000	20	\$40,000	\$800,000	50	\$ 7,000	\$350,000
Canton-Hankow Railway, Hankow Section	6	90,000	540,000	6	20,000	120,000	200	7,000	1,400,000
Canton-Kowloon Railway	3	90,000	270,000	10	40,000	400,000	—	—	—
Canton-Samsui Railway	3	90,000	270,000	20	40,000	800,000	—	—	—
Hankow-Peiping Railway	30	90,000	2,700,000	30	40,000	1,200,000	300	7,000	2,100,000
Tientsin-Pukow Railway	20	90,000	1,800,000	30	40,000	1,200,000	300	7,000	2,100,000
Peiping-Suiyuan Railway	25	90,000	2,250,000	40	30,000	1,200,000	300	7,000	2,100,000
TOTAL			\$8,190,000			\$5,720,000			\$8,050,000

ESTIMATED COST OF MATERIALS FOR REPAIRS

NAME OF RAILWAYS	Old Locomotives			Old Coaches			Old Wagons		
	No. Required	Unit Cost	Total Cost	No. Required	Unit Cost	Total Cost	No. Required	Unit Cost	Total Cost
Canton-Hankow Railway, Canton Section	10	\$ 8,000	\$ 80,000	80	\$ 1,000	\$ 80,000	200	\$800	\$160,000
Canton-Hankow Railway, Hankow Section	18	10,000	180,000	8	2,000	16,000	78	500	39,000
Canton-Kowloon Railway	5	10,000	50,000	30	1,000	30,000	—	—	—
Canton-Samsui Railway	5	10,000	50,000	100	1,000	100,000	—	—	—
Hankow-Peiping Railway	43	10,000	430,000	58	3,000	174,000	340	500	170,000
Tientsin-Pukow Railway	60	10,000	600,000	40	4,000	160,000	300	500	150,000
Peiping-Suiyuan Railway	58	10,000	580,000	10	1,500	15,000	90	500	45,000
TOTAL			\$1,970,000			\$575,000			\$564,000

Grand Total : \$25,069,000

The Consortium's Attitude Towards China



R. Thomas Lamont in his address before the China Society in New York, commented on the attitude of the Consortium toward China, in a manner so clear and definite that his meaning could not at all be misunderstood. He said:—

"Your Chairman in his introduction alluded to my interest in the International Consortium for the assistance of China. In this connection may I point out once more that the aims and purposes of the Consortium have apparently never been clearly understood in China? The Consortium was organized in 1920, not for the purpose of securing a monopoly of Chinese Government finance, but of co-operating in extending the financial aid which the Chinese Government and/or Chinese Provinces might seek in the construction of railways or in other sound economic developments. At that time, you will recall, the Chinese Government was none too stable, and the bankers of no single one of the so-called Western nations were prepared alone to undertake the responsibility of loans to China. Therefore, they were grouped together in much the same way as was the old Six-Power Group which made the so-called Re-organization Loan to China; and it was hoped that by this grouping more effective service could be rendered for Chinese affairs.

For the last eight years, however, or since the organization of the Consortium it has obviously been impossible for any existing Government in China to command credit from the Consortium or from any other group of bankers. The situation now is that the Consortium stands ready, as it has heretofore, to listen to any proposals which the Chinese Government may make for the co-operation in the building up of great public utilities in China. This by no means implies a promise to lend money to China at the present time. Necessarily a considerable period must elapse before the present authorities show by their prudent course that China is entitled to credit from world investors. If and when this period is completed and the fact is made clear then, as I say, the Consortium will, if requested by China to do so, be prepared to lend its co-operation in whatever way may be feasible."

The fact is that all Powers are extending to China the hand of friendship. The Consortium represents the financial strength of the principal Powers and it must be taken into account in any calculations of the practical expressions of friendship. China is too often guided in these matters by ancient suspicions as to the purposes and motives, which inevitably leads to a wasteful wrangle

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China and Japan's Food Problem

By Moriyoshi Taba

THAT Japan is overburdened with a teeming population, unbalanced by a limited food supply and other natural resources necessary for home industries, is a too well-known fact. The population problem in Japan might be called a cancer on her national politics, inasmuch as the problem has a significant relationship to the food question which is threatening the nation with various aspects of social unrest—Communist terrorism, strikes, lock-outs and unemployment. Indeed, it will not be too much to say that Japan's high politics, domestic as well as foreign, hinge 100 per cent. on the probability of the harmonious solution of the problem of population and food supplies.

Although the problem is too hard a nut to crack in a day, we are pretty sure that it would be solved peacefully someday by the Japanese liberal leaders of to-morrow, as the young generation of Japan to-day has outgrown the Imperialist's dream to secure a place in the sun at the high cost of the blood of the people. However, Japan should be given a safety valve in one form or another, along peaceful lines, to support her sons and daughters so that she may avoid a confusion worse confounded. An economic interdependence, social solidarity, free movement of men and materials, freedom of "give and take"—these leading principles of our generation of to-day and to-morrow should be upheld with much enthusiasm by champions of humanity, so that we may see a perpetual reign of peace in the Far East, which is now the political centre of the universe. It would be, therefore, too optimistic to expect the Japanese to die a martyr to starvation with her arms and feet bound together or to see her resorting to such a negative measure, as birth-control for the solution of her population issue.

Then what is the present situation of the food supplies in Japan? According to the 1926 returns, the total area of Japan's paddy field is about 3,100,000 Cho (1 Cho=2.45 acres) covering nearly half of the total cultivated land and the total output of rice is estimated at 55,591,000 Koku (1 koku=4.96 bushels).

The figures for domestic supplies and consumption of rice in these few years are given as following in 1000 koku.

			Supplies	Consumption	(—)
1922	..	..	60,694	62,857	2,163
1923	..	..	55,444	66,736	11,292
1924	..	..	57,170	65,789	8,619
1925	..	..	59,704	67,038	7,334
1926	..	..	55,591	64,596	9,005

Now, taken as a whole, we can see in the above analysis that the shortage of rice supplies in Japan ranged from eight million koku to twelve million koku per annum.

Being thus unable to make both ends meet in rice supplies, Japan imported rice from foreign countries including her overseas dependencies, as well as other farm products year by year, which can be analyzed as followed in Y.1000 and 1000 piculs:

	1927		1926		1925	
Articles	Piculs	Yen	Piculs	Yen	Piculs	Yen
Rice, Paddy	9,748	79,907	5,759	50,694	12,859	120,499
Barley	1	8	19,403	145	12,022	80
Wheat	7,774	53,920	11,717	93,346	7,727	70,522
Millet	250	1,372	116	654	140	972
Soya Bean..	6,635	41,198	7,021	49,028	7,173	53,032
Beans, Peas	2,012	11,711	1,891	12,361	2,025	17,357
Kaoliang	703	2,770	567	2,549	443	2,163
Wheat Flour	333	2,869	121	1,274	76	888
Other Flours	359	2,976	259	2,673	286	3,129
Total	27,815	196,731	46,854	212,724	42,743	268,642

These farm products which are imported into Japan to the annual value of about Y.200,000,000 are mostly consumed as food supplies with a very few exceptions, which are used for industrial purposes, while about 5,000,000 koku of domestic rice are consumed for breweries. Although the import of these commodities into Japan fluctuates according to the crop situation in Japan proper,

we cannot but admit that the unbalanced food question is greatly relieved by the imported articles.

In the above analysis, we can see that Japan's production of rice is remarkably unbalanced by the consumption, resulting in an enormous shortage of this commodity by the neighborhood of ten million koku per year. Further, the future aspect of Japan foodstuff situation cannot but be a gloomy one in the light that the rate of increase of rice crops can hardly keep pace with that of rice consumption. Consequently, Japan must depend upon her overseas dependencies—Korea and Formosa—to support her nationals at home, while she cannot depend entirely upon the latter which can hardly meet all the requirements of the former, further importing foodstuffs from other foreign countries—British India, French Indo-China, Siam, etc.

As for Japan's import of rice and paddy from China, it is hardly worth mentioning as compared with those imported from other foreign countries mentioned above, recording only 0.013 per cent. of the total imports in 1926 and 0.033 per cent. in 1927, as shown in the following table in Y.1000:—

Import from	1927	1926	1925
China	2,635	665	2,292
British India	20,367	15,795	48,624
French Indo-Chine	25,159	19,331	43,743
Siam	20,487	12,385	22,442
U.S.A.	8,675	2,490	2,356
Others	1,583	28	1,041
Total	78,906	50,694	120,498

The production of wheat crops in Japan is declining year by year. The total output which recorded 6,787,000 koku in 1917 declined to 5,895,000 koku in 1926 after an elapse of ten years, and during years 1922-1926, it marked only 5,640,000 koku in average per annum.

While, on the other hand, it showed an increasing demand for this article in recent years, so much so that the native production could hardly meet the needs of the nation.

The total import of wheat into Japan during these three years is revealed as follows in Y.1000:—

Import from	1927	1926	1925
China	2,260	—	168
U.S.A.	18,366	25,293	25,581
Canada	19,273	32,834	13,508
Australia	13,982	35,103	31,243
Others	49	116	23
Total	53,930	93,346	70,523

In the above analysis, we can understand that China's contribution of wheat to the total import into Japan recorded only 0.04 per cent. in 1927 as against none in 1926. In view of the fact that Japan imported wheat to the aggregate amount of Y.72,000,000 during these three years, the provenances being mainly the U.S.A., Canada and Australia, it might be said that Japan's import of wheat from China is almost none, as compared with that imported from other foreign countries.

Although the soya bean crop in Japan marked the total amount of 4,270,000 koku in 1920, which is the record, the output of the crop showed a declining tendency as a result of a decrease of the total area of the bean field, the average output recorded being 3,900,000 koku in the past few years and the future prospect is gloomy. The utilization of the article in Japan is manifold, being mostly consumed for the manufacture of "Miso," a necessary stock for Japanese soup, soy and "tofu" or bean-curd, which articles are quite indispensable to the daily life of the Japanese masses, while soya bean is also used for the manufacture of manure, bean cakes and various confectionaries, the total consumption for these purposes amounting almost to eight million koku or so per annum. While, on the other hand, the total output of this commodity in Japan falls far short of the actual requirements of the

mass consumption the eventual consequence is that Japan imports an enormous volume from foreign countries. In view of the fact that the quantity of the article exclusively used for the manufacture of "tofu" and soy is estimated at 3,660,000 koku, the shortage speaks for itself.

Japan imported soya bean to the total amount of 7,000,000 piculs, valued at about Y.50,000,000 per annum in these few years, mostly from Manchuria. According to recent trade returns, the total import of soya bean into Japan from China including Kuangtung Province amounted to 5,646,210 piculs valued at Y.34,488,000 in 1927 as compared with 5,433,281 piculs, Y.37,623,000 in 1926 and 6,721,934 piculs, Y.50,334,000 in 1925 respectively. It should be noted that Japan is virtually depending upon China, to the greater extent, for her total import of this staple article.

Besides, Japan imports various beans and peas to a considerable volume. The total import from foreign countries of such beans as red, white beans, horse beans, peas, ground-nuts and others, all included, was estimated at 2,013,000 piculs valued at Y.11,713,000 in 1927 as against 1,890,000 piculs, Y.12,364,000 in 1926 and 2,025,000 piculs, Y.17,360,000 in 1925, while Japan's import of these goods from China, including Kuangtung Province, is estimated at 1,593,000 piculs, valued at Y.9,531,000 in 1927 as compared with 15,570,000 piculs, Y.10,407,000 in 1926 and 1,495 piculs, Y.13,300 respectively. Thus analyzed we can understand that China has provided almost 80 per cent. of the total import of various beans and peas into Japan.

The annual production of "Kaoliang" in Japan does not count much and the import of this commodity entirely depends upon Manchuria with the annual import of about 500,000 piculs valued at two million yen. The output of millet in Japan is also limited to the volume of 1,400,000 koku in average per annum causing the country to import the article from Manchuria to a comparatively small amount of one million yen per annum these few years. However, it should not be overlooked, in this connection, that Manchurian millet imported into Korea is so remarkable that the crop serves greatly to alleviate, although indirectly, the shortage of food supplies in Japan, in view of the fact that Korea imports millet from Manchuria only to export rice to Japan proper.

Although the total output of Indian corn in Japan is estimated only at 700,000 koku per annum, its import into Japan from China is less remarkable, seeing that the utilization of the commodity is much limited in the daily life of the Japanese.

Import of Meat, Eggs and Salt

Owing to various reasons, religious, climatic, and time-honoured customs not to require animal products such as leather, hides, bristles, etc. Japan's stock-breeding industry has been neglected. The breeding of cattle, horses, sheep, hogs and other domestic animals for riding, farming and food purposes was not so popular as in other countries until very recent times.

According to the recent investigations the number of domestic animals and slaughtering returns for food supplies, the analysis runs as follows in 1,000 :—

		Cows	Horses	Sheep	Goats	Swine
1923	..	1,469	1,265	15	159	668
1924	..	1,456	1,255	16	158	743
1925	..	1,460	1,237	17	168	673

Animals slaughtered for food supplies :—

		Cattle	Calves	Horses	Goats	Swine
1923	..	311	27	74	9	389
1924	..	319	26	77	9	589
1925	..	296	22	77	12	766

Although poultry-raising has been in much evidence in Japan, in recent years, the industry is only encouraged in farm villages with no large poultry-yards worth mentioning, and consequently, the output of poultry cannot meet the domestic requirements in chicken and eggs, leading to the enormous import from China. In 1925, for instance, the total output of fowls was estimated at Y.38,881 as against Y.39,906 and Y.39,929 in 1923 and 1924 respectively.

As to the dairy industry, it is still in its infancy at best. It is most common that milk is used in its fresh state with a very limited demand for cooking purposes. Butter-making is also still limited, while the ham industry is thriving rather well with a certain volume exported abroad.

As Japan is also short of such foodstuffs as fresh beef, fresh eggs and salt, she imports them from China which can be analyzed as follows in 1,000 piculs and Y.1,000 :—

		1927	1926	1925
		Pls. Y.	Pls. Y.	Pls. Y.
Fresh Beef	..	276 7,195	250 7,481	181 6,196
Fresh Eggs	..	244 9,982	286 11,317	424 12,590
Salt	..	2,954 2,540	2,038 2,114	2,109 2,338

Total .. 3,474 19,717 2,574 20,862 2,614 21,124

The import of salt into Japan from foreign countries is analyzed as compared with that imported from China in Y.1,000 :—

		1927	1926	1925
China	..	2,540	2,114	2,338
Germany	..	51	45	80
Spain	..	394	638	177
Africa	..	279	443	281
Others	..	329	421	153

Total .. 3,593 3,661 3,029

In summary, we come to understand that Japan's import of farm products for foodstuffs from China accounted for very roughly 30 per cent. of the total import of the same products into Japan from foreign countries in these three years, while Japan imported from China fresh beef, fresh eggs and salt to the amount of Y.19,717,000 in 1927, Y.20,862,000 in 1926 and Y.21,124,000 in 1925 respectively, almost entirely depending on the latter for these animal products and salt.

Paradoxical as it may sound, China, which is an age-long agricultural nation with the farming population of about 80 per cent. of her people, and has been regarded, and is still regarded as a rich supplying country of food-stuffs and industrial materials to the world is a large importer of food supplies and other various raw materials.

True, China is a much favored nation with the abundant natural resources still dormant deep under the earth, but she is not developed enough as she should be someday to offer her hidden gifts for her national existence as well as for the welfare of her friendly nation. The principle of the "open door" and equal opportunity applied to China seems at best to be a mere desk argument as long as she remains a vast stretch of virgin soil with no improved cultivation of farm products and development of various industries. Contrary to the expectation of the world, the import of various foodstuffs and raw materials into China from foreign countries is increasing year by year. That China imported an enormous volume of such staple farm products as rice, wheat and wheat flour, sugar and sea products along with raw materials, namely, raw cotton and coal, and especially the import of sugar and sea products from Japan is outstanding. It is indeed surprising that the import of foodstuffs into China from foreign countries which comprised about 19 per cent. of the total imports of China in 1913 increased to 24 per cent. in 1925 and the import of raw materials which recorded about 15 per cent. of the total imports in 1913 increased to 28 per cent. in 1925, both of which showed a remarkable advance. Thus the present-day China is suffering the dearth of foodstuffs and raw materials. Furthermore, it seems quite strange to an outsider of the economic conditions of China, when the average Chinese are boasting of the vast area and boundless national resources of China, that the country stands first as the famine-stricken nation constantly menaced by the shortage of food in various provinces, especially in the North, accompanied by the subsequent exodus of the sufferers to the outside boundaries and the nation-wide social unrest. The increasing tendency for China's import of foodstuffs and raw materials can, of course, be attributed to a certain extent, to the chronic famine and the increase of the teeming population, but it should be responsible to the greater extent for the rich natural resources and various industries left undeveloped owing to the political, economic as well as social instability of China.

In the field of farm products, for instance, if the land is well developed and irrigated to the best capacity so that it can produce varieties of rice, wheat, etc., China's foreign trade balance will be favorably regulated, not only covering amply the domestic requirements, but also enjoying surplus production to export to foreign countries. In this connection, we cannot but point out one of the most evil policies of China in the shape of the Prohibition Act

(Continued on page 10).

More on Sino-Japanese Amity

NO matter what efforts are made by Chinese and Japanese officials to end the deadlock in the relations between the two countries, failure results because of mere technicalities. An underlying cause for the failure is the curious belief in China that the Tanaka Government in Japan cannot outlast the present Diet and that therefore China can gain much by merely marking time; while in Japan, there is a body of opinion which assumes that the present Nanking Government cannot survive beyond next March and that therefore Japan has much to gain by marking time. It does not appear to be a counsel of wisdom to base a policy of state upon the probability of the fall of an existing Government. Such tactics cannot but increase the bitterness on either side, until relationships become altogether impossible.

Meanwhile, incidents attending the anti-Japanese boycott increase, the one in Hankow barely escaping the condition of a cause for intervention.

Perhaps the principal impediment to a solution of the Sino-Japanese imbroglio is the necessity of finding a "face" saving device, so that neither Government will disappoint its own people. The National Government of China abrogated the Sino-Japanese Treaty of 1896 and therefore is unwilling to sign such a Tariff Agreement as the Soong-MacMurray Agreement, which would, in effect, be a revision of a few tariff clauses of a treaty which China regards as null and void. Japan, on the other hand, has never recognized the abrogation of the Commercial Treaty of 1896 and therefore cannot accede to the position. At the same time, no middle ground seems to have been discovered although Mr. Soong, Dr. C. T. Wang and Mr. Yada have labored hard and anxiously upon general terms, with regard to which an agreement has been reached.

The following statement of the Japanese position is interesting and important because it represents an authoritative consensus of Japanese opinion on these questions:

No nation seems to understand Japan less than China, and in China none less than the statesmen of the Kuomintang. In spite of compelling proofs to the contrary, they seem to attribute to Japan policies which belong to pre-Versailles period. What Japan did for China since the Washington Conference and what she has declared herself ready yet to do to assist China in realizing her national aspirations ought to have impressed the Nationalists of China sufficiently to make them pause and think. If they found it convenient at one period for purposes of internal politics to depict Japan black and stir up anti-Japanese agitation, one would have expected them to resort to a more constructive policy now that they have succeeded in their work of national unification.

The course the Nanking Government is at present steering would, after all, do more harm to China herself than to Japan, for Japan has no rights and interests in China which are not so just and lawful that she can with good conscience and in the face of the entire civilized world adopt measures to protect them herself if necessary. That is what she did in Shantung and that is what she would be constrained to do in any other part of China so long as there is no authority in China to which Japan can look with reliance for the protection of her legitimate rights and interests.

That, however, is neither a desirable nor a normal relationship between nations, and no nation is more desirous than Japan to see a normal and mutually trustful relationship established between herself and China. It was with that end in view that Japan, sinking minor differences, decided to enter into negotiations with China over the revision of the commercial treaty and incidentally to liquidate all pending questions between the two nations. Losing sight of what Japan considers as the main issue of the situation, the Nanking statesmen, for reasons best known to themselves, chose to attach undue importance to a side issue, making it impossible for Japan to proceed any further.

That the Japanese Government look upon the Tsinan affair merely as one, although the most serious, of many similar incidents occurring in the past, such as those of Nanking and Hankow, and that they intend to settle it as such incidents are generally settled was clearly indicated in their communication to Nanking of July 18, in which they demanded apology, punishment, indemnification,

and assurance for the future, conditions which are usually demanded and accepted in such a case. Regrettable as is the Tsinan incident, and very desirable as it is for Sino-Japanese friendship that this and other pending questions of similar nature should first be wiped off the slate, Japan would not have thought of making the solution of these minor questions the condition precedent to opening negotiation over the revision of treaty, the satisfactory conclusion of which would mark a new epoch in the relationship between Japan and China. When Consul-General Yada first proceeded to Nanking, his principal mission was to make preliminary arrangements for the negotiation of the treaty, the questions of Hankow, Nanking and Tsinanfu coming up for discussion merely as corollary. As to the Tsinan question, his instruction was to discuss the matter, if at all, only in general terms for the purpose of paving the way for the final and detailed settlement on the spot.

It was quite beyond the comprehension of the Japanese Government that, when the discussions seemed to proceed favorably and an agreement to be near on most of the questions, the Chinese Government should suddenly and unexpectedly raise the question of the withdrawal of Japanese troops from Shantung, making it the *sine qua non* of entering into negotiations upon any other questions including that of treaty revision.

It ought now to be clear to the Nanking authorities that the Japanese troops were dispatched to Shantung and still remain there for no other purpose than the protection of the lives and interests of the Japanese nationals, and that unless, through a satisfactory settlement of the incident, the feeling of the local Chinese populace is quieted down to such an extent as to cause no concern for the safety of the resident Japanese, the Japanese Government would be accounted negligent of their duties if they were to withdraw their troops entirely irrespective of the actual local conditions. It ought to be equally clear to them, therefore, that the best and only reasonable way of securing the withdrawal of the Japanese troops would be for China to try and create conditions which would give no excuse for the presence of armed Japanese in Shantung. They would thus be doing a service not only to themselves but to the Japanese Government who would be so relieved of an onerous and unpleasant duty. The attitude of the Nanking Government is all the more incomprehensible because it has been made abundantly clear to them not only that Japan has no intention whatever to utilize the Tsinan affair for the attainment of any ulterior objects, but that she would be ready to go very far in meeting the Chinese standpoint, consenting to considerable reduction of the very moderate demands originally advanced.

While the Japanese Government sincerely sympathize with the legitimate aspirations of China and would do all they reasonably can, they cannot afford to allow their own very important rights and interests to be trifled with by irresponsible elements in China. Conscious of the justice and fairness of her intentions, Japan would not suffer herself to be easily shaken in her correct and equitable determination.

China and Japan's Food Problem

(Continued from page 9).

regarding the export of cereals which serves fatally as a handicap for the free movement of commercial goods along the line of best profits, irrespective of domestic or outer boundaries, leading to discourage the home production of the farm products. Such a traditional policy tinted with the suicidal feudalism may produce nothing but the famine horrors, paradoxical as it may sound.

If the revolutionary heroes of Young China can devote themselves to the fresh salvation work of the people in the exploitation of natural resources accompanied by the reconstruction of communication facilities in pursuance of Dr. Sun's Socialism or Min-Sheng Chu I, and can drop such an artificial practice as the prohibition of the cereal export, then we might expect that China can be the land of milk and honey in every sense of the word. China's national reconstruction should begin with the emancipation of farmers and reconstruction of an economic fabric of an ancient régime.

Book Notes

Manchurian Policy

Modern Manchuria and the South Manchuria Railway Company. By Henry W. Kinney, Dairen, 1928

Mr. Kinney, who is connected with the South Manchuria Railway, has produced a handbook on Manchuria, which may be accepted as authoritative as to the general facts and as conclusive as to Japanese policy. The volume becomes increasingly important as the issues between Japan and China increasingly become focussed on Japan's extraordinary position in Manchuria, for whereas, the Chinese have been contending that Japan's purpose is to Koreanize Manchuria, the Japanese hold that their major interest there is economic and strategic and that they are not participating in the internal affairs of Manchuria, except as Japan's economic investments and strategic position are imperilled.

Primarily, the story of Manchuria, in its present chapter, deals with two broad questions, immigration and the railways. Millions of sturdy Chinese peasants, from Shantung and Hopei (Chihli) come to Manchuria, with families and chattel, driven from their homes by famine, flood, plague, military exactions, civil wars and the countless natural and unanticipated evils which mark revolutionary China. They come from small agricultural holdings to a land of vast open spaces, where there is ample opportunity for every man who will work. Here, they are given land and agricultural machinery of a type they have not known heretofore and they are told to go to work. In due course, their products are carried to Dairen, Vladivostok and the Korean ports on railways, the mileage of which is constantly increasing. In a word, a new Empire is being created by immigrants in Manchuria and the apparent foster-parent of that Empire is the South Manchuria Railway, which has an economic state in its success.

Railways in Manchuria are now owned by China, Japan and a Russo-Chinese partnership. The Chinese are building a number of new railways, to bind together the three provincial capitals of Mukden, Kirin and Tsitsihar. Some of these new railways are built in conflict with previous agreements with the Japanese. In this connection, it is interesting to note Mr. Kinney's statement of S.M.R. policy, for what Mr. Kinney writes on this subject must be regarded as having official sanction. He says:

"These protests are based on the Sino-Japanese agreement of 1905 by which the Chinese undertook to construct no lines parallel or competing with the South Manchuria Railway. The railways mentioned are in open violation of this agreement, but it is of paramount importance to observe that the position taken by the officials of the S.M.R. is an extremely liberal one. Their point is that at this time when the Chinese are showing increasing disregard for treaties and agreements, it is essential that Japan, for one, insists on such observance, least, by failing to do so, a dangerous precedent be established which may lead to still further violations. Once the Chinese show their willingness to admit their obligations, say these S.M.R. officials, Japan is willing to show a liberal spirit. The point of competition will be regarded as of less importance." Again, he stated the S.M.R. case in the following:—

"Briefly, for the vast scale development of Manchuria the employment of foreign capital is desirable. Foreign bankers will not loan such to the Chinese direct, as they have no means of protecting such investments. Such protection can, however, be provided where funds are furnished through the Japanese, who can furnish guarantees satisfactory to the bankers abroad. Japan is interested in Manchuria's development as these provinces can form an important factor in her own industrial development, partly by producing raw material and partly by becoming a market for Japan's manufactured goods. But, as has been shown, the Chinese are the ones who benefit the most, and it may be pointed out in this connection that such lines as have been built through Japanese loans or contracts are Chinese in ownership and are (with the exception of the Kirin-Changchun line, which is Japanese managed under a special arrangement) under direct charge of the Department of Communication of Peking, *both nominal and actual management being Chinese*. The same will be the case with new lines built in Manchuria."

Mr. Kinney's book should be read by those interested not only in Manchuria but in the present Sino-Japanese conflict. It provides a basis for a revaluation of popular conclusions based not on facts but on propaganda. Mr. Kinney avoids propaganda. He limits himself entirely to a factual statement of the case and he achieves that with his usual ability. G.E.S.

Mine and Quarry Book

"The Edgar Allen Mine and Quarry Book" which has just been issued, gives in summarized form an account of the products they supply for the use of mines and quarries. The subjects discussed range from crushings and grinding machinery, including stone-breakers, ball mills, tube mills etc., to lime hydrators; rotary dryers; replace parts for crushing machinery in manganese steel, chrome steel, and other steels, hollow and solid mining drill steels; steels for granite working; etc., etc. This book should be of considerable value to all mining engineers and quarry managers. A copy will gladly be sent on application to Edgar Allen & Co., Ltd., at the Imperial Steel Works, Sheffield.

Tea Machinery

MESSRS. HENRY POOLEY & SON, LTD., Birmingham, England, have issued an interesting catalogue on Tea Machinery for cutting, sifting and blending, manufactured by Bartlett & Son, Ltd. This illustrated catalogue is informative and suggestive and those interested in improving conditions of the tea trade will find it advantageous to write to Henry Pooley & Son, Ltd. for a copy.

Booklets for Locomotive Engineers

THE SUPERHEATER COMPANY has recently issued the following three booklets which are of interest to railway engineers and which may be obtained from this Company by writing to 17 East 42nd Street, New York.

"The Design and Proportion of Locomotive Boilers and Superheaters," by C. A. Brandt, Chief Engineer of this Company. This paper is from the address by Mr. Brandt before the Canadian Railway Club at Montreal, February 14, 1928. All who are interested in locomotive design will find Mr. Brandt's paper worthy of thoughtful study. "Elescooperation"—briefly sketches the service of this company to the railway field and the wide application of locomotive devices.

"1928 Locomotive Progress"—illustrates a number of representative examples of modern locomotives which give a fair cross-section of American motive power of to-day. For each locomotive illustrated the general dimensions are given which have been carefully compiled. In some cases they were checked by the railroads themselves. All the locomotives illustrated are equipped with either Elesco feed water heaters or exhaust steam injectors, showing the general acceptance of these devices. Other facts concerning the design, equipment or service are also given.

The Consortium's Attitude Towards China

(Continued from page 7)

over procedure. The bankers of the world want to help China, so that the industrialists of all countries will have markets here for their goods. For decades, China has been held forth as an example of a vast, potential market, but China has not developed into a vast, actual market because there has been no complete and scientifically designed plan for the financial exploitation of her possibilities. It is not a matter of a few million thrown into one Government loan or one industrial enterprise: it is a matter of a comprehensive scheme of development, of hundreds of millions for rehabilitation.

The Metropolitan Vickers Self-contained Turbo-Generator

A TURBO-GENERATOR embodying a notable advance on anything in the way of turbine machinery previously available is to be installed by the Japan China Spinning and Weaving Company, Ltd., in their Hua Feng Cotton Mill at Woosung.

Turbo-generating units, at any rate so far as moderate powers are concerned, have up to the present followed a practically stand-

ardized lay-out, evolved by the simple process of connecting together the various pieces of apparatus necessary for the operation of the plant. The turbine and generator rest generally on substantial concrete foundations with the condenser in a basement: the circulating pumps are arranged where convenient on the lower floor; while steam ejectors, oil coolers, etc., are placed where room may best be found for them. Not only does the usual lay-out occupy a

great deal of space and require a supervision of machinery on two floor levels, but it involves also separate motor drives for the circulating and condensate pumps with the consequent risk of interruption of these essential auxiliaries. The arrangement is far from ideal, whether regarded from the standpoint of cheapness of installation, ease of operation, or mechanical efficiency. Indeed, in the case of the smaller machines, as required for industrial power or for work on shipboard, the defects of the standard lay-out are sufficient in many instances to lead to the installation of some competitive type of prime mover, thus limiting the employment of steam turbine machinery in fields which otherwise would be peculiarly its own.

The problem of the design of small and medium-sized turbo-generating sets for ordinary industrial purposes has been thoroughly studied by the Metropolitan Vickers Electrical Company, of Manchester, which has resulted in a new design comprising a radical departure from the standard layout, and it is a machine of this type, which is to be installed at the Hua Feng Mill. This will be the first turbine of the new type to be put into service in the Far East, though over fifty such sets have been supplied or are on order, including 23 for the British Admiralty and three for use in the construction of the Singapore Naval Base.

The turbo-generator is a self-contained machine. The turbine and condenser have been combined into one unit, the auxiliaries are mechanically driven from the main shaft, instead of straggling all over the place, and the com-

pactness thus obtained eliminates the necessity for a basement and even for foundations as ordinarily understood. The driving of all auxiliaries direct from the set greatly simplifies starting and operating and results in a higher efficiency as well. Efficiency, indeed, has been studied with the same care as compactness and simplicity, and the use of a small high-speed turbine geared to a low-speed alternator permits of both the steam and the electrical

end being designed each for its best performance. Finally we may add that the set is provided with a special type of governor gear of extreme sensitiveness, giving perfect governing in spite of the small "fly-wheel effect" of the rotating parts.

The new self-contained turbo-generator units are built, so far, in sizes ranging from 300 kw to 4,000 kw. All sets are similar in principle and differ only in the details of design. The view on page 13 which shows a set rated at 1,000 kw.

illustrates the general appearance of the type. This illustration conveys, better than words, an idea of the simplicity and compactness of the arrangement. The combination of the turbine and condenser is effected by having the upper half of the condenser casing or, in some sets, the whole of the condenser casing cast integral with the lower half of the turbine casing. The combined unit is supported at the H.P. end by a specially strengthened bearing on the gear-box and at the L.P. end by flexible I beams under feet provided on the condenser casing. The alternator, exciter and circulating pump are all coupled in line and driven from the slow-speed shaft of the reduction gear. The extraction pump in this set is driven by gearing from the slow-speed shaft of the reduction gear at the turbine end of the gear case, and the oil pump is arranged immediately below the governor gear and driven by an extension of the vertical spindle. In the smaller units the position of these two auxiliaries is interchanged. The air ejectors are of the steam-operated type and are mounted on the circulating water pipe near the intake to the condenser.

Turbine

The turbine, shown in section in Fig. 1, is designed to give its rated output at 5,000 r. p. m. and is suitable for a wide range of steam conditions. It is of the single-cylinder impulse type, having one velocity stage and eight impulse stages. The cylinder is divided on its horizontal center line and the top half

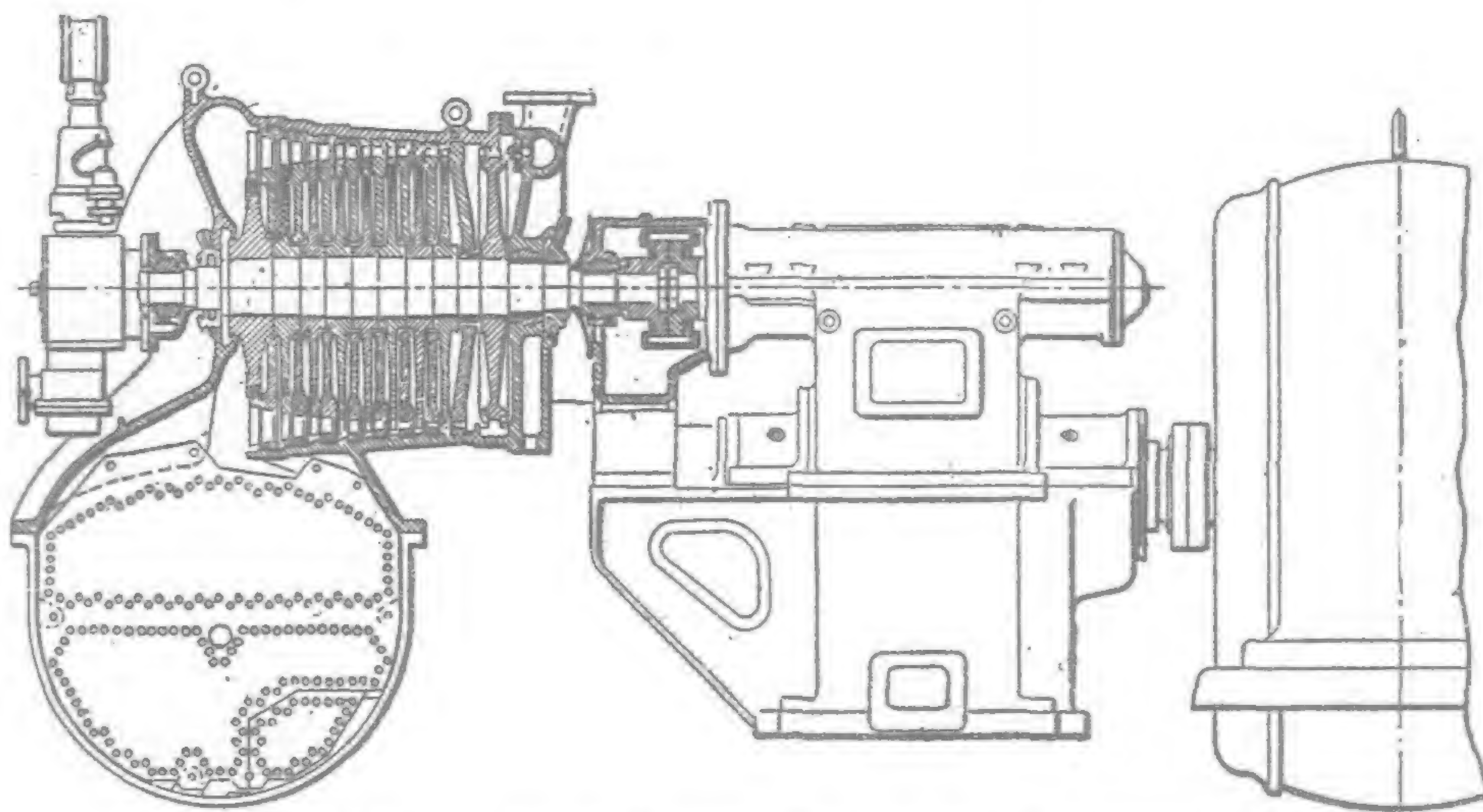


Fig. 1.—Section Through Turbine and Condenser

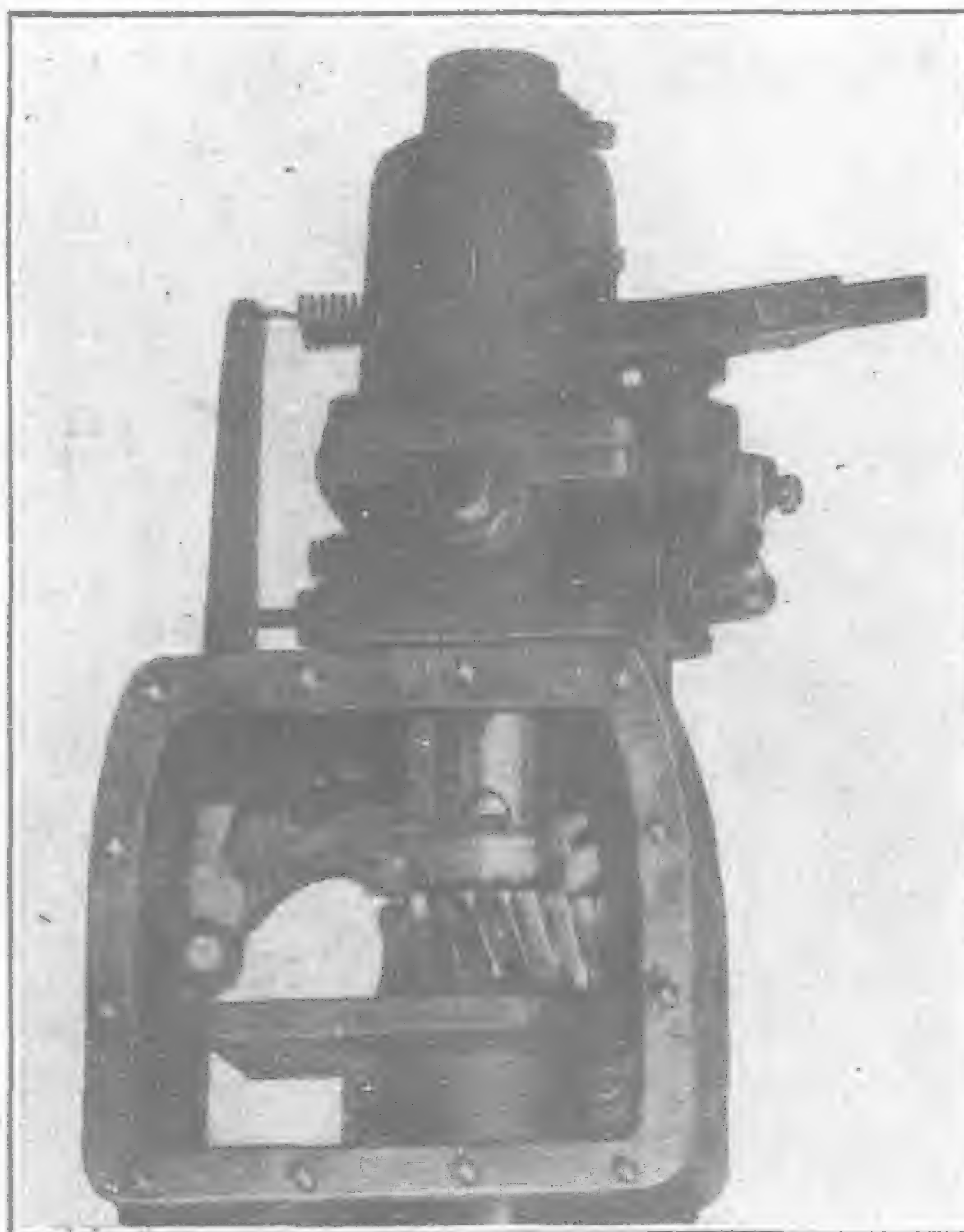


Fig. 2.—Governor in Casing

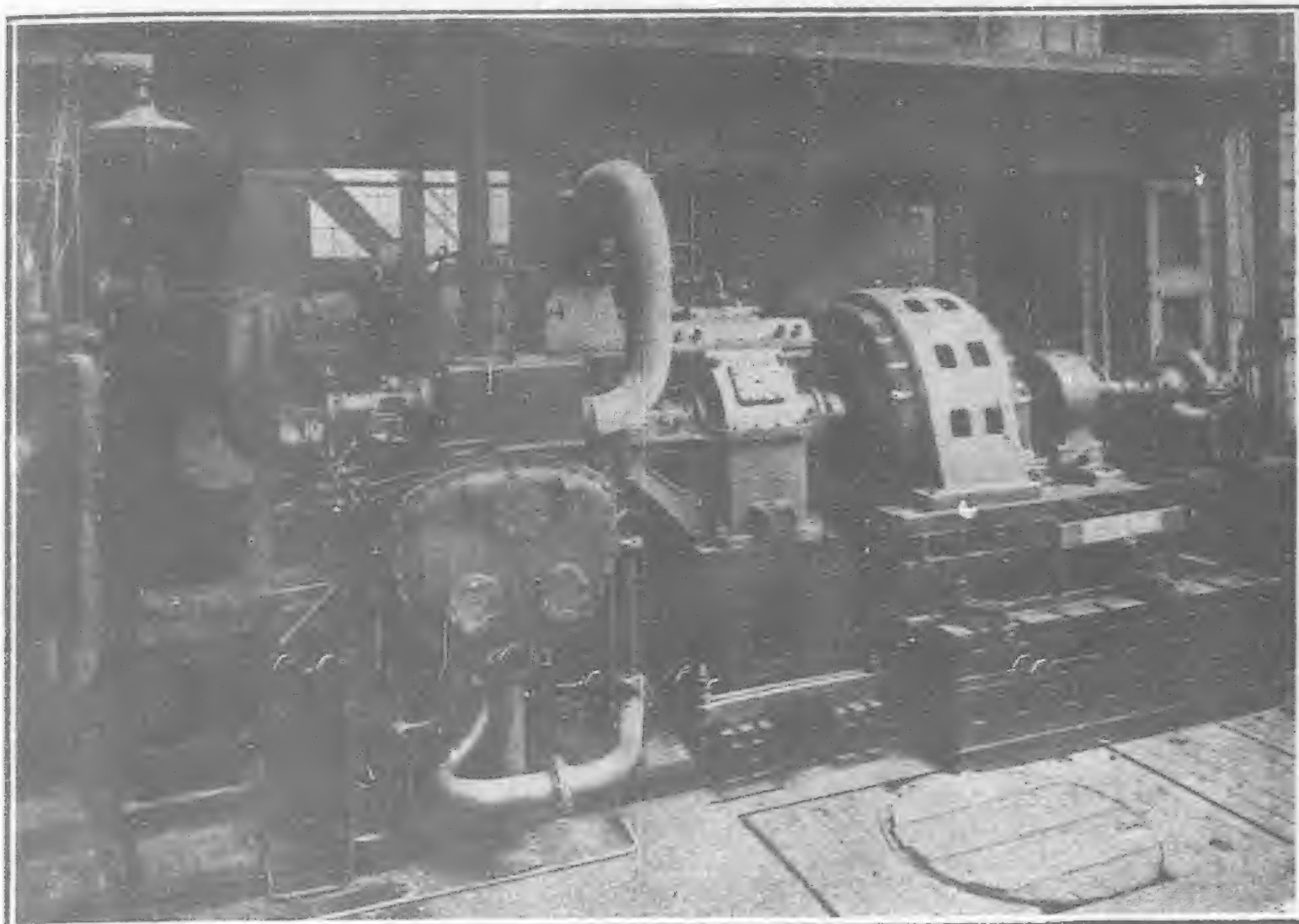


Fig. 3.—The Combined Set on the Test Bed

is split into two sections. Cast steel is employed where the steam conditions render this desirable.

The diaphragms are of cast iron with cast-in blades or, where necessary on account of steam conditions, of the built-up type with machined guide blades and steel centers. The diaphragm glands are of the labyrinth type. The high-pressure spindle gland consists of a multi-throttling labyrinth steam gland and a Metrovick water-sealed gland which has an impeller rotating in a race fed with water. The low-pressure gland consists of a water paddle of the usual type. The nozzles are built up of steel angles and accurately fitted vanes and are machined all over. They are arranged in two groups separately supplied with steam and controlled by separate valves. One group of nozzles provides for an output up to the economic rating of the turbine, the other group providing for additional load above this valve.

The rotor consists of forged steel wheels, machined all over, pressed on to a mild steel shaft and driving through substantial keys. The first wheel carries two rows of blades compounded for velocity. The other wheels each carry a single row of blades. The blades are of 5 per cent. nickel steel with the exception of those at and near the dew point, which are of stainless steel. The steam chest is of cast steel or cast iron, according to the steam conditions. It is supported by the condenser and connected to the turbine cylinder by two pipes which are arched to take up expansion. It is fitted with a combined stop and emergency valve, a steam strainer and two automatic governor valves which are operated by oil relay and control respectively the supply of steam to the two groups of nozzles. By an ingenious mechanical arrangement the sequence of opening of the governor valves can be changed by a single movement of a hand lever. This forms a convenient provision for meeting partial load with reduced throttling loss.

Governor

The governor is of a very interesting type introduced some years ago by the Metropolitan-Vickers Company for the regulation of high-speed turbines. In this connection it is important to note that the modern tendency to increased output at given speeds of turbine operation has necessitated a reconsideration of methods of speed regulation. The reason for this is that the comparatively small mass and diameter of the high-speed rotor make its fly-wheel effect much less than that of the larger slower speed

machines formerly used. This reduced inertia necessitates speed regulating gear of extreme sensitivity and rapidity of action. It was primarily in order to meet this requirement of increased speed of action for high-speed machines that the development of the new Metrovick governor was undertaken. The success which the makers have experienced with the type of governor used on these sets has led them to extend its application to a considerable proportion of the turbines they manufacture, including machines of much larger output than those here described.

Fig. 5 shows the new governor as designed for the 1,000 H.P. turbine. The sectional drawing—Fig. 9—illustrates the mechanism more clearly, while the diagram—Fig. 7—makes clear the action of the apparatus. Control is effected by means of an oil relay valve which is operated by the governor, and regulates the oil pressure in a power piston operating the valves. A compensating sleeve device on the relay valve is adjusted by a lever coupling from the power piston. This provides the differential system essential to stable relay governing. An important feature of the arrangement is that the oil relay valve rotates

with the spindle while the compensating sleeve is free to rotate between the valve and the casing, thus reducing to a minimum the friction resisting vertical movement.

The detail of the governor mechanism is shown in Fig. 9. The vertical spindle is driven by worm and wheel from the turbine spindle. Besides operating the governor itself, it is extended downwards to drive the turbine oil pump, and is keyed loosely at its upper end to the tachometer spindle. The weight of the rotating parts is carried on a collar thrust bearing just below the worm wheel, while free running is obtained by the ball bearings just above the two governor weights. The governor weights are of modified L shape and are pivoted on knife-edges. Fig. 9 shows the weights in position as at rest while Fig. 7 shows them in the running position, lifting the upper part of the spindle against the pressure of the spring. This part of the spindle carries the relay piston, which is retained in position by a nut above, and held to the rotation of the spindle by a key at its lower end. The relay piston is so shaped as to provide communicating channels between four oil supply and drain chambers A, B, C, D. Of these B is the oil pressure chamber connected to the supply from the oil pump, C is a control chamber connected to the underside of the power

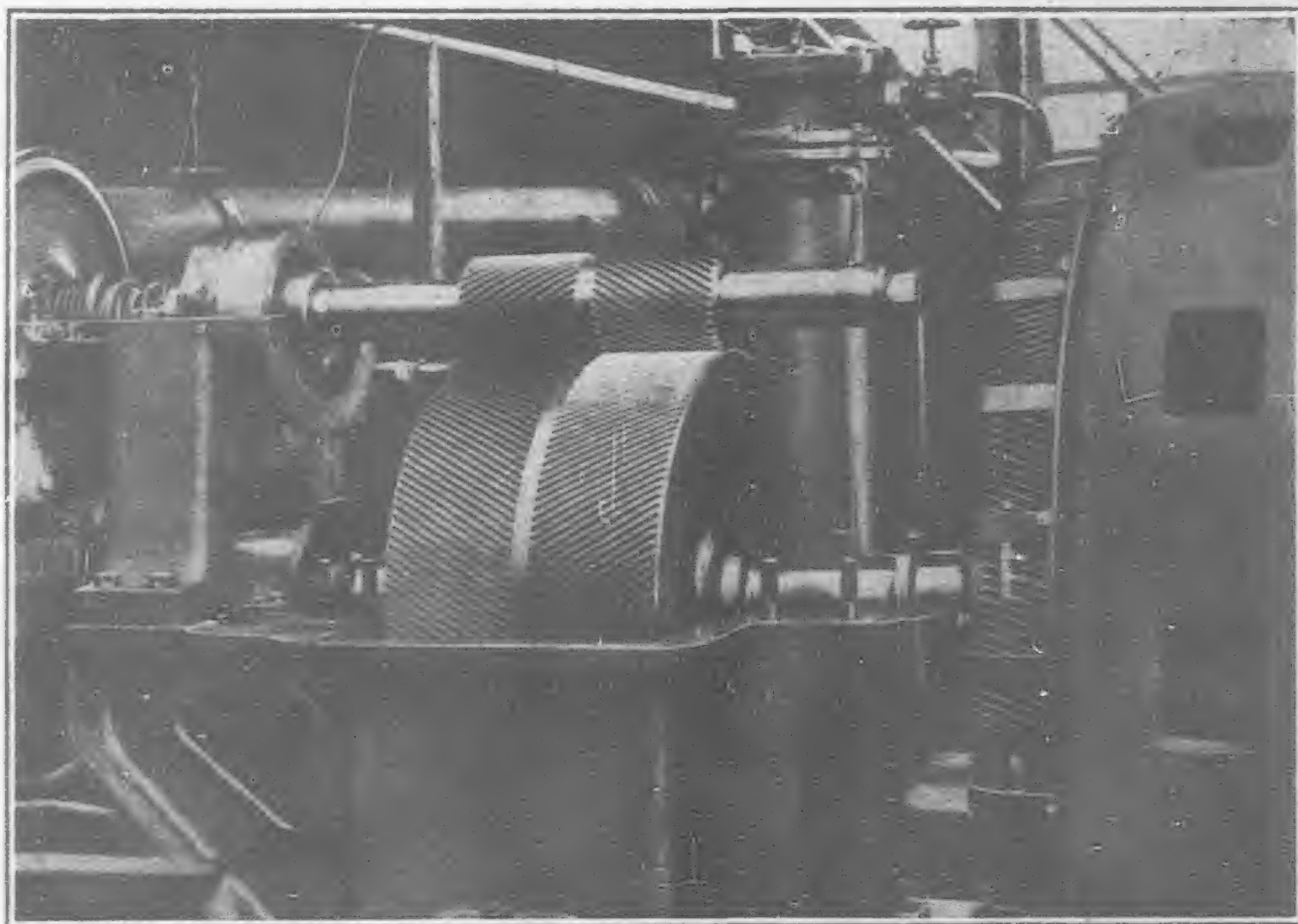


Fig. 4.—Reduction Gear—5,000 to 1,000 Revolutions per Minute

piston, while A and D are oil pressure release chambers. According to the amount of communication effected between these chambers the power piston is raised and increases the opening of the governor valves or is allowed to fall and reduces the opening. The amount of communication between the various chambers is controlled by the rise and fall of the relay piston and modified by ports on the compensating sleeve, which fits loosely round the piston and is raised or lowered by a lever coupling from the power piston which operates the governor valves.

When the turbine is running the whole of the spindle from the oil pump to tachometer, including the relay piston, rotates together. The compensating sleeve rotates slowly owing to the friction of the oil film between the piston and the sleeve, this rotation preventing any stickiness in the vertical movement of the sleeve relative to either the governor casing or the relay piston. Should increase occur in the speed of the turbine, owing, for example, to falling load, the weights swing further from the spindle and their lower ends lift the relay piston. This opens the port from the oil chamber C to the pressure release chamber D, allowing oil to escape from under the power piston, which falls and reduces the governor valve opening. The interconnecting lever from the power piston at the same time raises the compensating sleeve and gradually reduces the port opening until equilibrium is reached and the port is closed. In the case of falling speed the relay piston moves downward, opening the port from the pressure chamber B to the control chamber C. The oil pressure thus applied raises the power piston, which increases the governor valve opening, the movement being compensated by the sleeve as before. Speed adjustment can be obtained by the hand speeder gear shown, which by moving the fulcrum point of the compensating lever alters the relative position of the relay valve and the power piston.

The close association of the governor and relay valve elements is one of the notable features of the construction, the extremely rapid communication which is thereby effected between the governor and the governor valves giving a very close speed regulation with no trace of hunting.

Additional safeguard against overspeed is provided by a bolt type emergency governor, which is shown in Fig. 9, mounted in the turbine spindle. The spring-retained bolt, when moved out by excessive centrifugal force, engages with a lever which is connected to valves in the relay oil pressure system. These valves effect an immediate release of the oil pressure in the relay system without, however, reducing the pressure of the lubricating oil. The release of oil pressure not only closes the governor valves by means of the power piston already mentioned, but also releases an emergency trip device on the main stop valve. A hand trip device with push knob is also provided to operate the emergency trip lever.

The operation of the valve sequence changing device already mentioned may best be explained by reference to Fig. 7. By a simple hand lever movement the pull of the governor spring can be trans-



Fig. 5.—Governor for 1,000 kw. Turbine

ferred to one side or the other of the mid point on the linkage between the two governor valves. This determines the order of opening the valves, since the valve remote from the spring is opened first. By this selective device the smaller group of nozzles, ordinarily used for the overload output, can be used alone as an efficient arrangement for light load conditions and throttling losses for all conditions are reduced to a minimum.

Oil Supply System

The supply of oil for operation of the governor relay valve and power piston, and for lubrication of the main governor parts, the speed reduction gear and the turbine and gear bearings, is maintained at pressure by the oil pump already mentioned, which is driven from the governor spindle.

The pump is of the rotary gear valveless type, drawing oil from a tank placed beneath the condenser. The supply to the relay valve is delivered direct, but the supply to the bearings is through an oil cooler, the oil flowing back to the tank by gravity. An auxiliary pump is provided for flooding the bearings on starting up.

Condensers

The condenser is of the surface type, arranged for the steam to flow over and the water through the tubes. The shell is usually of cast iron and there is a cast iron water-box provided with inlet and outlet branches for the circulating water and arranged with end covers having suitable inspection doors. The tubes are of solid drawn brass secured in rolled brass plates by screwed ferrules and tape packings. The tube-plates are stayed internally and held against the shell flanges by a number of collar bolts. A suitable steel baffle plate is fitted to ensure that the incondensable gases are cooled on their way to the air ejector.

Circulating Pump

The circulating pump fitted as standard is of the centrifugal type. It is connected by a flexible coupling to the exciter shaft. The casing is split on the horizontal center line, the suction and discharge branches being on the bottom half. The impeller is of the double-entry hydraulically-balanced type; made in gun-metal and mounted on a mild steel shaft, the shaft being protected by bronze sleeves where in contact with the water.

Air Ejector

The air ejector is shown in Figs. 8 and 6. It is of the two-stage steam-operated type, provided with inter and after coolers of the surface type.

Simplicity of operation has been given prior consideration, and for this reason the ejector has been mounted in the circulating water main leading from the discharge of the circulating pump to the inlet of the condenser. The inter and after coolers consist of U-shaped tubes of solid drawn brass, the steam passing inside the tubes and the circulating

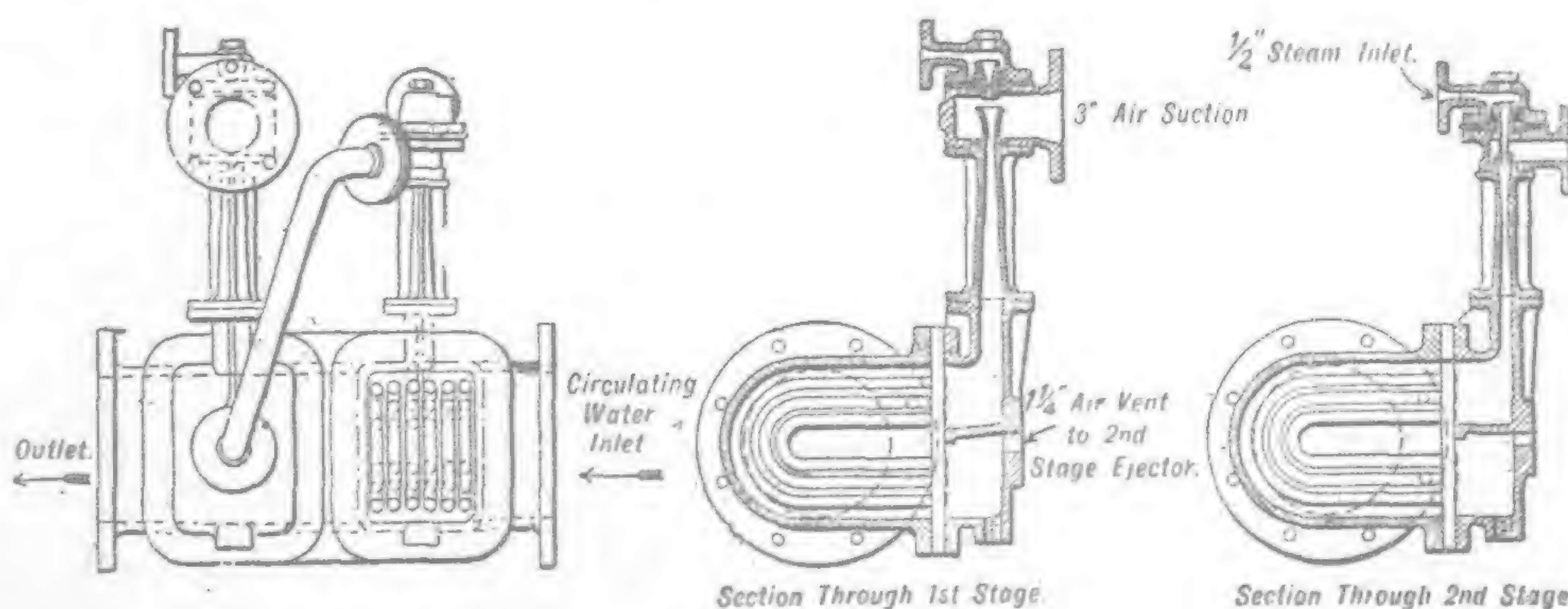


Fig. 6.—Arrangement of Air Ejector

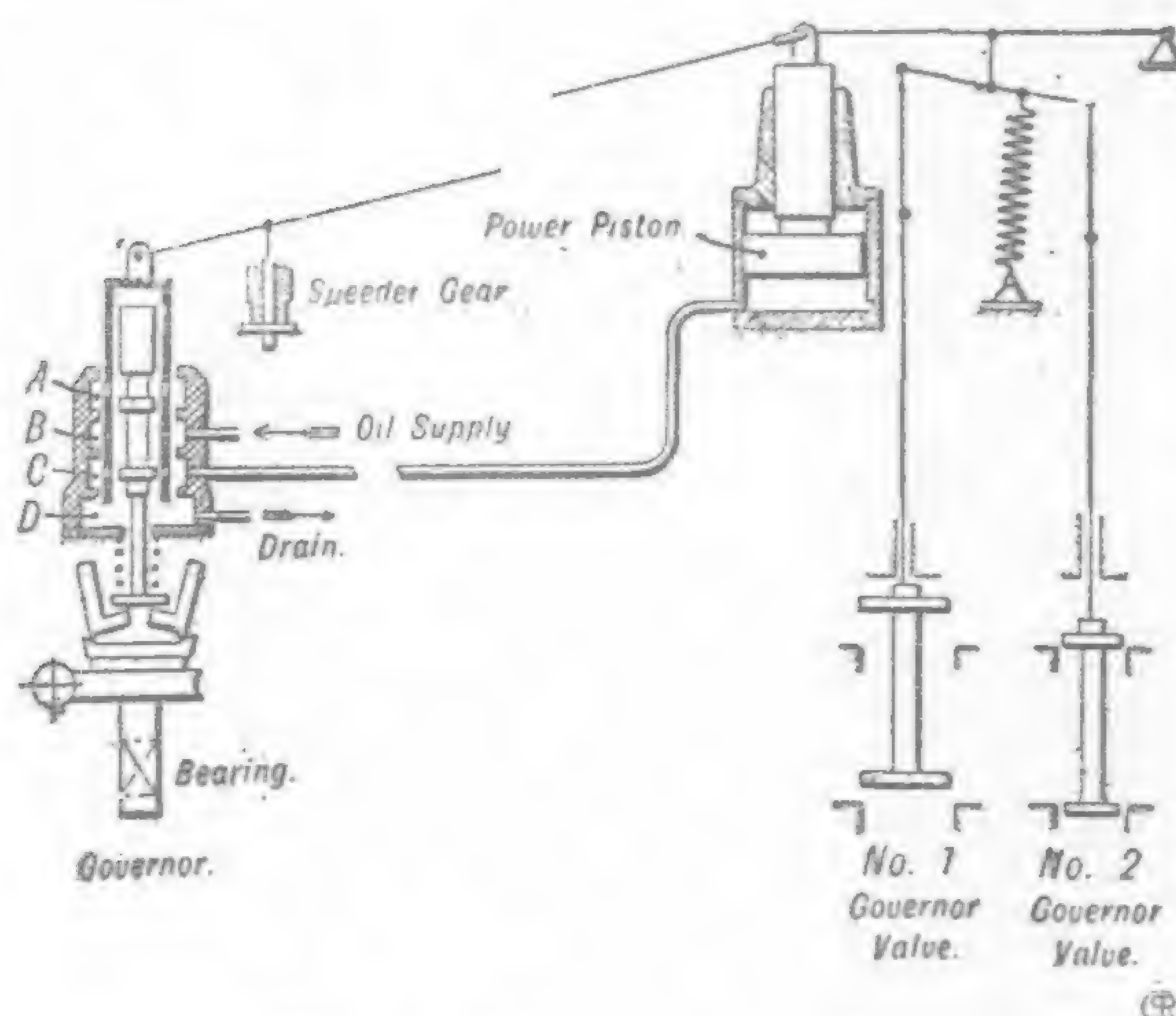


Fig. 7.—Diagram of Governor

the cooling medium is immediately available, since the circulating water pump is coupled to the generator shaft and commences to circulate water as soon as the turbine commences to rotate. Full vacuum is thus built up very rapidly. Each stage of the ejector is provided with a steam operating valve and the necessary gauge, which is conveniently mounted at the turbine end of the set. The gauge board carries also the other instruments comprising steam pressure, vacuum and oil pressure gauges.

Speed Reduction Gear

A speed reduction of 5,000/1,000 r.p.m. is given by a gear of the double helical single-reduction type, arranged with the pinion vertically above the wheel. On page 13 is a view of the gear with the top half of the casing removed. The pinion is integral with the high-speed shaft, the whole being machined from high-quality alloy steel. It is connected to the turbine by a flexible coupling of the Wellman-Bibby type manufactured by the Metropolitan Vickers Company under licence. The gear wheel consists of a cast iron centre piece with a shrunk-on forged steel rim, the wheel being hydraulically forced and keyed on to a mild steel shaft. The teeth of both the pinion and the wheel are of involute form, hobbled on a machine which has been modified by the Metropolitan Vickers Company to give an exceptionally high degree of accuracy. The gear bearings are of the rigid type, having split cast iron bushes lined with white metal and lubricated by oil under pressure. The inboard high-speed bearing is designed to carry part of the weight of the turbine unit as already mentioned, and the outboard slow-speed bearing carries part of the weight of the generator rotor.

Generator

The sets can be supplied with either alternating-current or direct-current generators as required. In either case the machine is connected by solid coupling to the slow-speed shaft of the gear and supported on that side by the gear bearing, as described above.

The set illustrated includes an open protected type alternator with its exciter.

The exciter is of the open protected type, the armature being carried on an extension of the alternator shaft without outboard bearing. It is a simple shunt-wound machine designed for stability over a wide range of voltage under the

water externally. The tubes are expanded into a rolled brass tube plate, to which is also attached the casting that carries the bronze parts of the ejector proper. The chief advantage of having the ejector mounted in the circulating water main is that, on starting up the set,

control of a shunt field rheostat. The brush gear is carried on a bracket supported from the bearing pedestal.

Foundations and Building Space

The design of the new sets offers a final important advantage in respect of its small requirements of foundations and building space. The usual type of turbo set requires a foundation of two concrete walls, 2ft. to 3ft. thick and 12ft. to 14ft. high, between which are accommodated the condenser and generator cooling, equipment, and across the top of which is a steel joist reinforced platform carrying the turbine and generator. The new Metrovick set, owing to its comparatively small dimensions and light weight, and its extremely compact arrangement,

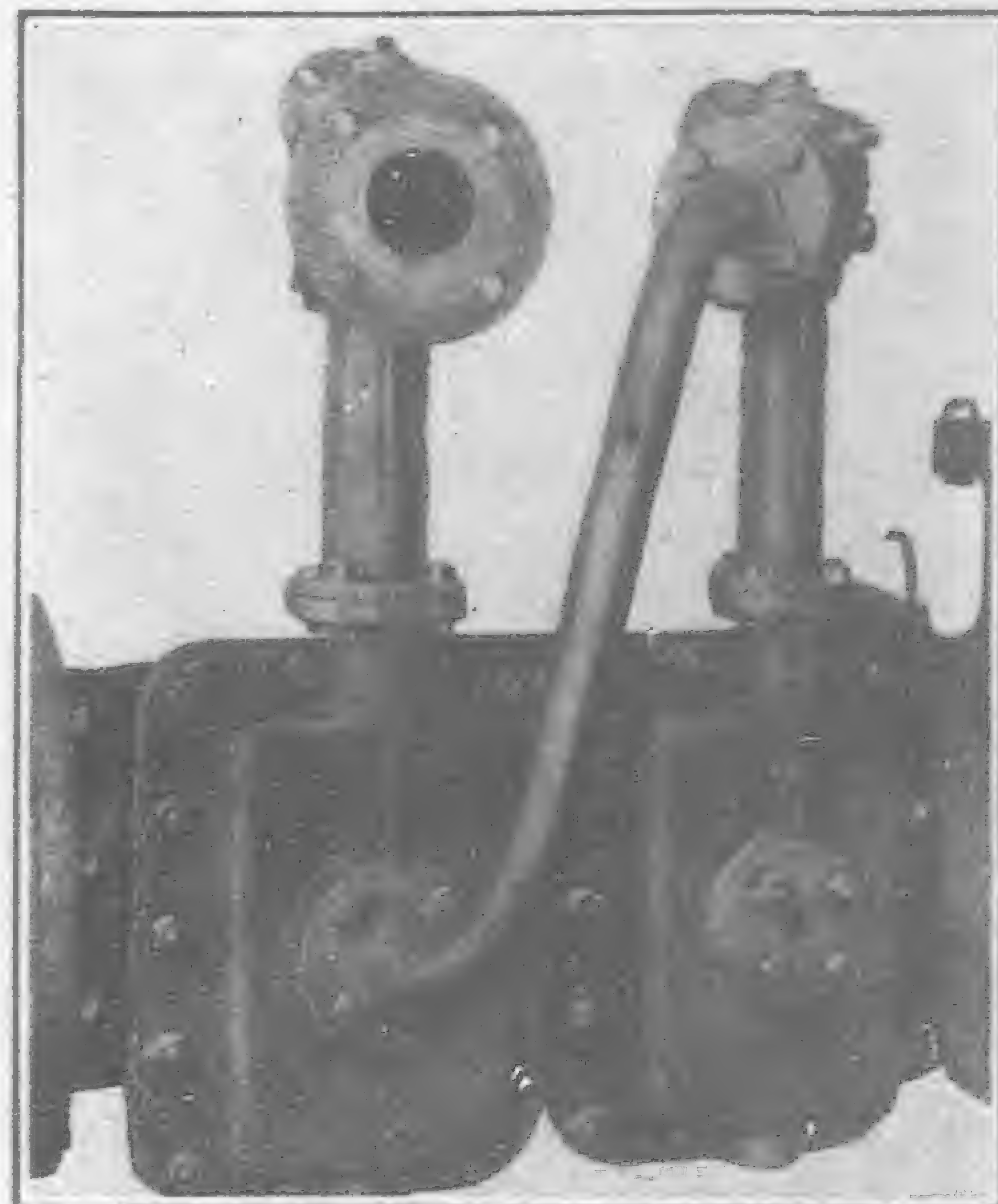


Fig. 8.—Two-Stage Air Ejector

requires merely a concrete floor reinforced with steel joist grillage with a small pit of about 2ft. 6in. in depth for the condenser and oil tank. The saving in this respect is increased by the simplicity of pipe and cable connections, as compared with the expensive construction of ducts through concrete foundation walls. It is estimated that the total foundation cost for the 1,000-kw set here described is only about one-sixth of the foundation cost for an old type set of equal capacity.

Valuable saving is also effected in building cost owing to reduced height requirements. Needing no basement, the set can be accommodated in a building about half the height of that required for the old types, the saving in height being actually about 12ft. to 14ft. The important saving in installation cost which results from this feature should not be overlooked. The saving in space is even more marked in the case of the two smaller sizes, the 300-kw and 500-kw sets, which occupy only about 30 per cent. of the space required for old-type sets of equal capacity.

Operation

The set is extremely robust and flexible in operation. Its properties in the latter respect are illustrated by the fact that after being shut down with all valves on the whole system closed, it can be run up to normal speed ready for load in less than one minute, an operation which we saw performed without the least difficulty or hurry.

The set being supplied to the Japan-China Spinning and Weaving Company, Ltd., by the Metropolitan Vickers Electrical Export Co., Ltd. will have a maximum continuous rating of 1,250 kw. It will be designed for a steam pressure of 300 lbs. per sq. ins. gauge, superheated 258 degrees Fahrenheit. The generator will be wound for a three phase 60 period 600 volt supply, and will run at 1,200 r.p.m. the turbine speed being 5,000 r.p.m.

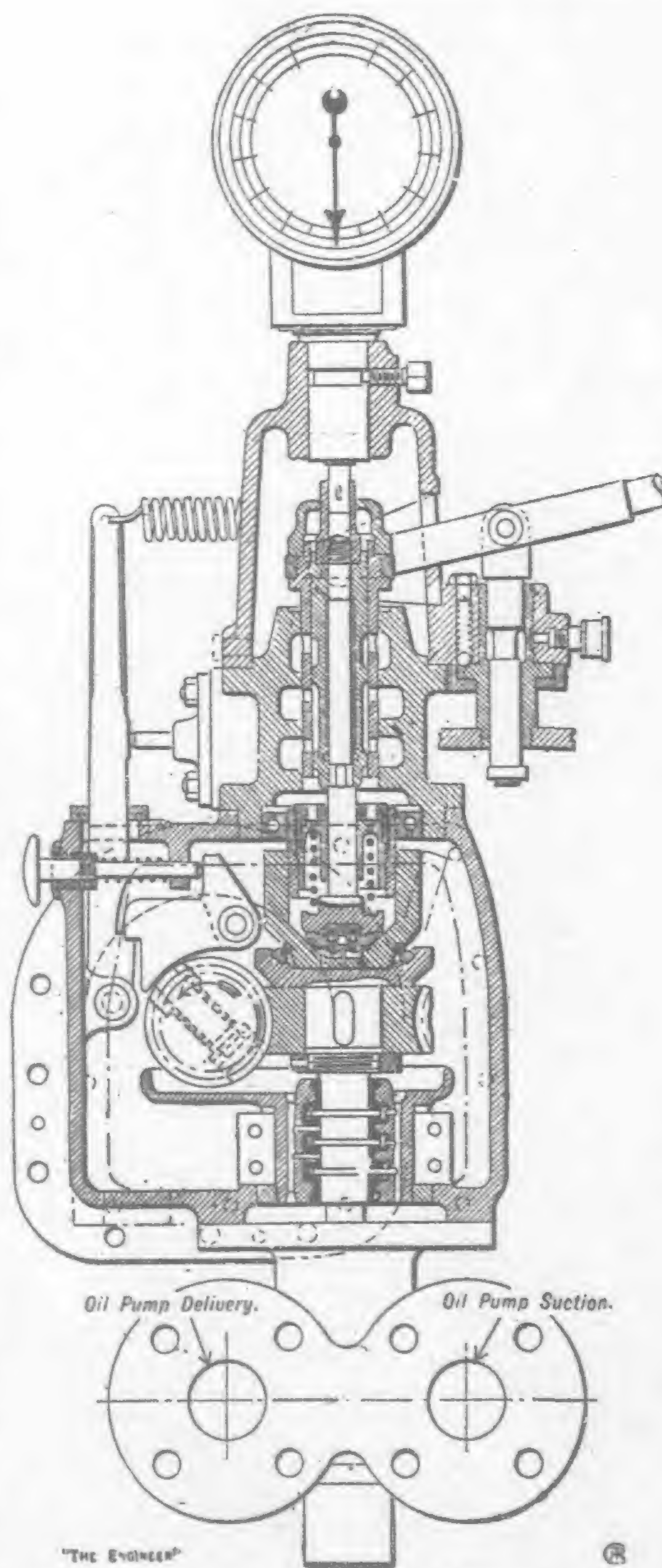


Fig. 9.—Section Through Governor Gear

Japan's Iron and Steel Industry, 1

By J. H. Ehlers, Assistant Commercial Attaché, Tokyo

FOREWORD

The Japanese iron and steel industry of to-day is but little more than a quarter century old, the initial step in its development having been taken in 1894 with the establishment, by imperial edict, of the Seitetsu Jo (Imperial Steel Works) at Yawata, on the island of Kyushu.

Perhaps the greatest problem facing the Japanese industry over this period has been that of securing and maintaining an adequate supply of good quality iron ore from which to produce the pig iron and raw steel demanded by the growing domestic market and to have available enough coke or coking coal to smelt and otherwise transform this ore into a usable form.

It is with this problem and the steps being taken by the Japanese iron and steel industry looking toward its solution that this bulletin has to do. As the first of three bulletins on the Japanese industry, it discusses the present sources of iron ore in active use, not only in Japan proper but also in Chosen and South Manchuria. The other bulletins of the series, which will bear the titles "The Japanese Trade in Iron and Steel Products" and "The Production of Iron and Steel in Japan," are in course of preparation.

The present bulletin was prepared in the Iron and Steel Division of the Bureau of Foreign and Domestic Commerce, from reports covering the Japanese iron and steel industry transmitted by Assistant Commercial Attaché J. H. Ehlers, Tokyo.

IN any discussion of the Japanese iron and steel production, it is necessary to understand clearly certain basic peculiarities of the industry. There are three principal areas in which iron and steel production takes place, namely, Japan proper, Chosen (Korea), and South Manchuria.

It is absolutely essential to know whether Chosen and Manchuria are included in any particular discussion or set of figures relating to the iron industry, as otherwise much misunderstanding inevitably results. For example, Japan may be said to be comparatively independent of foreign pig iron, if Manchuria and Chosen are included. The ore production of these two outlying districts is much greater than that of Japan proper.

Chosen is definitely Japanese territory by virtue of its annexation in 1910, hence its production is in every respect domestic production, although it is desirable to consider it separately in order to take account of the trade between the two areas.

Manchuria is not politically under Japanese jurisdiction, but the iron-ore extraction facilities are either purely Japanese or joint Sino-Japanese undertakings, under the control of Japanese interests and located in a zone fully protected by long-term leases. The South Manchuria Railway, controlled by and in part owned by the Japanese Government, controls the principal iron-producing

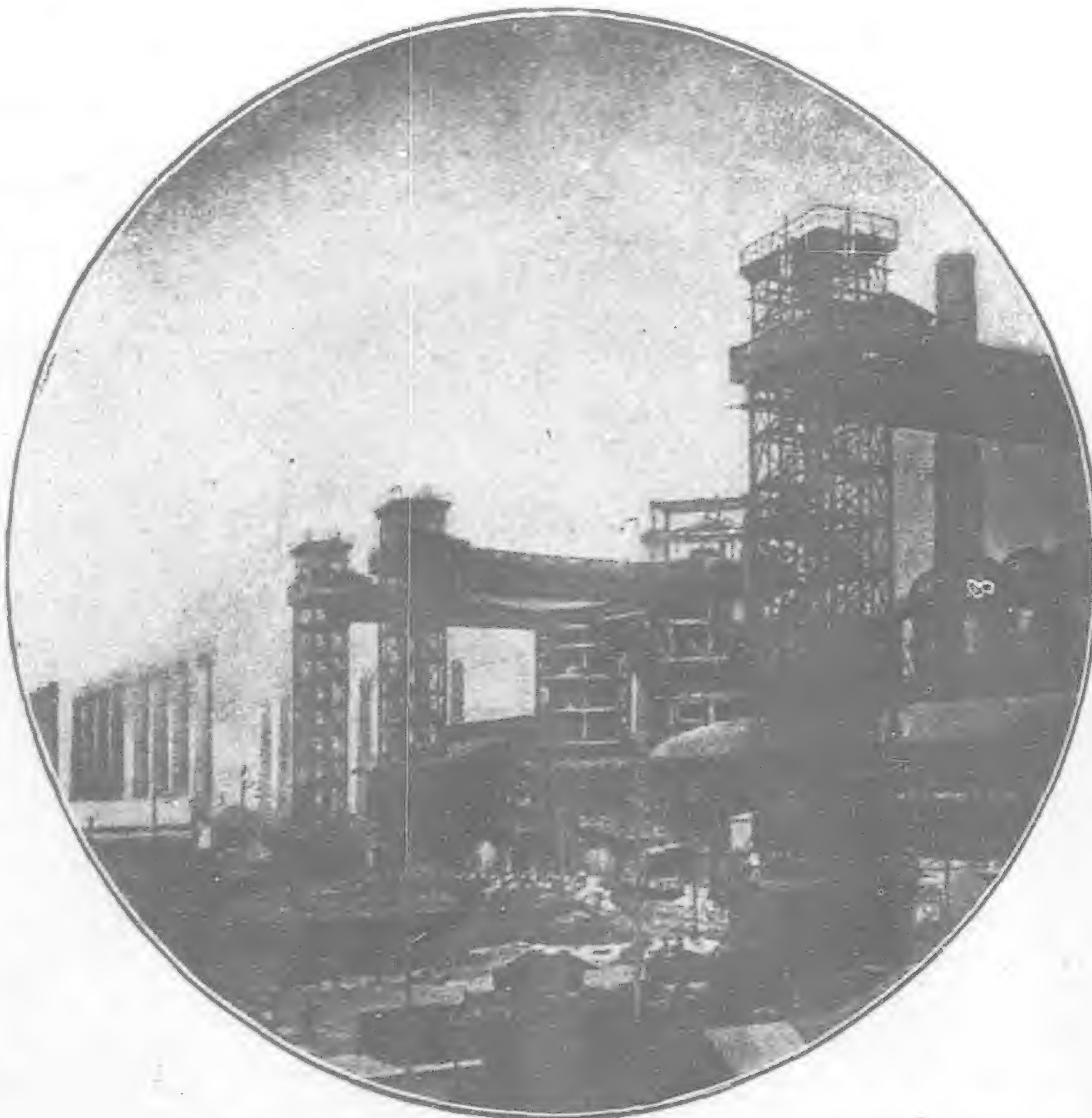
facilities in South Manchuria. Hence, from an economic viewpoint, this production is also essentially a part of the Japanese iron and steel industry.

While the iron and steel industry of Japan proper is the principal subject of discussion in this survey, the production of Chosen and the Japanese works in Manchuria will be considered. Iron ore and pig iron are the products of Chosen and Manchuria, practically no steel being produced at present in either of these areas.

Iron-Ore Reserves

The total iron-ore reserve utilizable under the existing metallurgical processes and mining operations is approximately 40,000,000 metric tons in Japan proper. Between 10,000,000 and 40,000,000 tons of additional reserves exist in Chosen, although these have not been as definitely surveyed as have those in Japan proper. Some ore deposits also occur in Taiwan (Formosa).

The classification of the utilizable reserves in Japan proper is as follows: Magnetite, 19,130,000 tons; hematite, 10,606,000 tons; limonite, 11,224,000 tons; making a total of 40,960,000 metric tons. These figures do not include iron sands, the deposits of which are enormous. The magnetite reserves, consisting largely of the deposits at Kamaishi, and to a lesser extent the limonite reserves, are much more readily utilizable than the hematite deposits.



Blast Furnaces at the Yawata Iron and Steel Works, Japan

The total reserves of the Japanese Empire are possibly 80,000,000 tons of utilizable deposits. In addition to these, there are possibly additional deposits amounting to 35,000,000 tons, largely of magnetite, at Kamaishi, of lower-grade ores, which can not economically be worked under present conditions.

Extensive though the Japanese reserves may appear from the foregoing discussion, they are comparatively insignificant in comparison with those of the world as a whole and of the other important steel-producing countries. Of the estimated world reserves of 57,000,000,000 tons, the United States is credited with deposits totaling 10,000,000,000 tons of high-grade ore, France with 8,000,000,000 tons, and Germany with 1,000,000,000 tons. Of the smaller reserves, Luxemburg is credited with 270,000,000 tons of workable low-grade ore and Belgium with 70,000,000 tons.

Japan has a great number of small iron mines from which ore can be obtained in times of urgent necessity, but very few of these mines can be worked under normal conditions. Not over 10 of them are of any importance. The mines in Chosen are individually and collectively more important than those in Japan proper. The deposits in Chosen are of moderately high grade, having in general between 50 and 55 per cent. iron content.

Iron Mines in Japan Proper

The principal mine in Japan proper is located at Kamaishi, Iwateken, and is operated by the Kamaishi Mining Co., which is now under the control of the Mitsui interests. The mine was discovered in 1823 and the smelting of ore was begun in 1849. The Government operated it for some years without success. The ore is magnetite and occurs at the contact between limestone and intrusive rock. This mine has workable deposits of 15,000,000 tons, with possibly 35,000,000 tons of ores below 40 per cent. iron content (averaging 30 per cent), and high in silica; these lower-grade ores are unworkable under present conditions. The workable deposits contain up to a maximum of 65 per cent. of iron, in general having between 50 per cent. and 60 per cent. iron content. The maximum production of this mine was reached in 1917, under the



General View of the Mitsubishi Iron and Steel Works at Kenjiho, Korea

incentive of war prices. In that year, the total production rose to nearly 150,000 tons. After the war production dropped off sharply, but it has recovered within the past two years and the mine will probably be more intensively worked in the future. This is the only deposit in Japan which warrants the establishment of smelting works located with reference to the ore supply.

The Sennin mines, in Iwateken, have been of some importance. These mines contain hematite deposits at the contact between limestone and intrusive rock. The ore is of approximately 50 per cent. iron content. These mines were first

worked in 1873, later abandoned, and afterwards reopened in 1900. A considerable amount of copper is also found in these deposits, the 1917 production of ores being 6,190 tons of iron ore and 695 tons of copper.

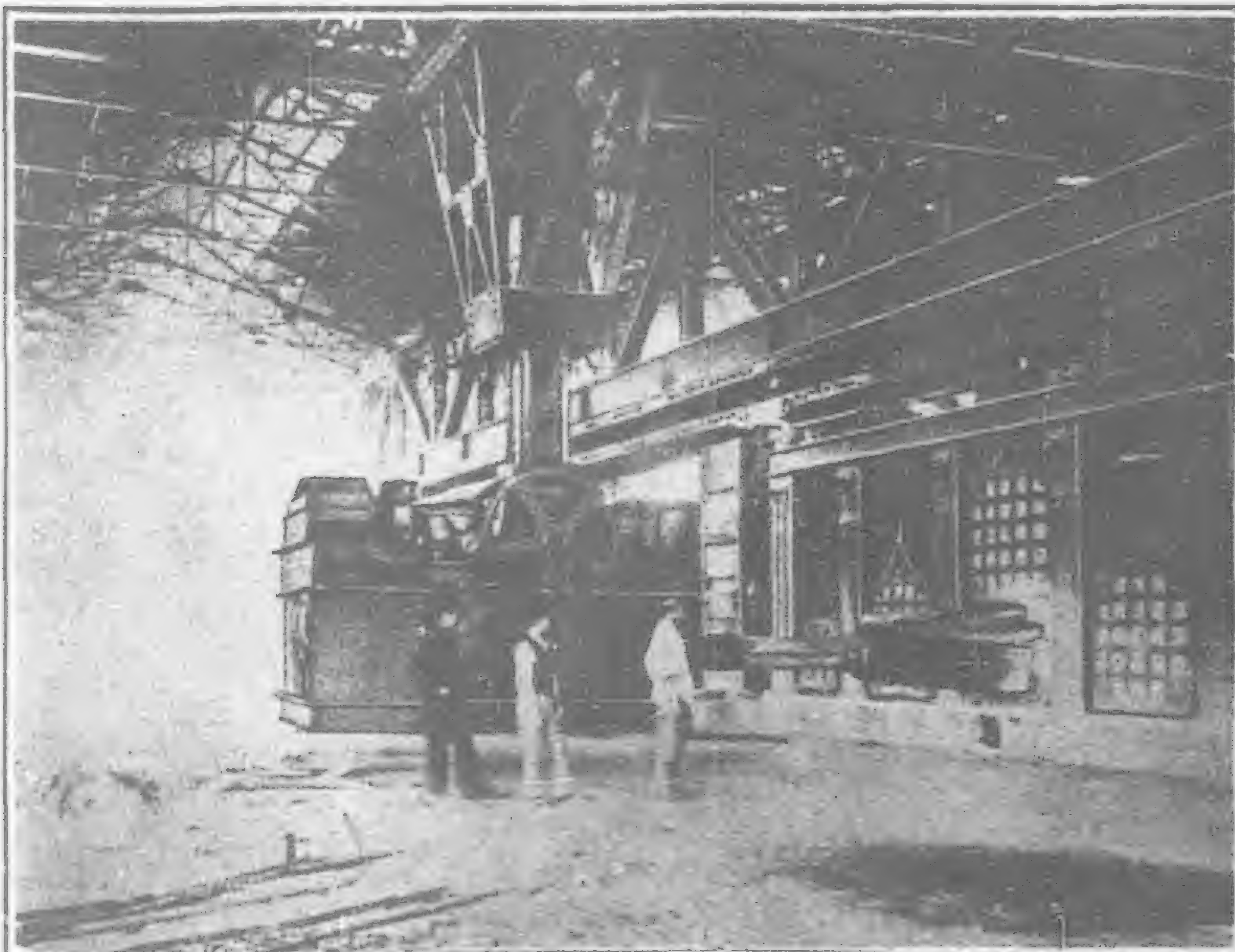
The mines near Abuta, in the Hokkaido district, producing iron ore are of small importance. These deposits are overlain with ash and mud to a thickness of five feet. They have been used as a source of supply for blast furnaces located in the Hokkaido.

The Japan Steel Works is working the Kutchan mine near Muroran, Hokkaido, to secure limonite supplies for its blast furnaces as Wani-shi, near by. These ores have an iron content of 45 to 53 per cent. The production is now about 60,000 tons per year, thus giving this mine a place second only to the Kamaishi mines. The present ore production of Japan proper is made up almost entirely of the output of these two mines.

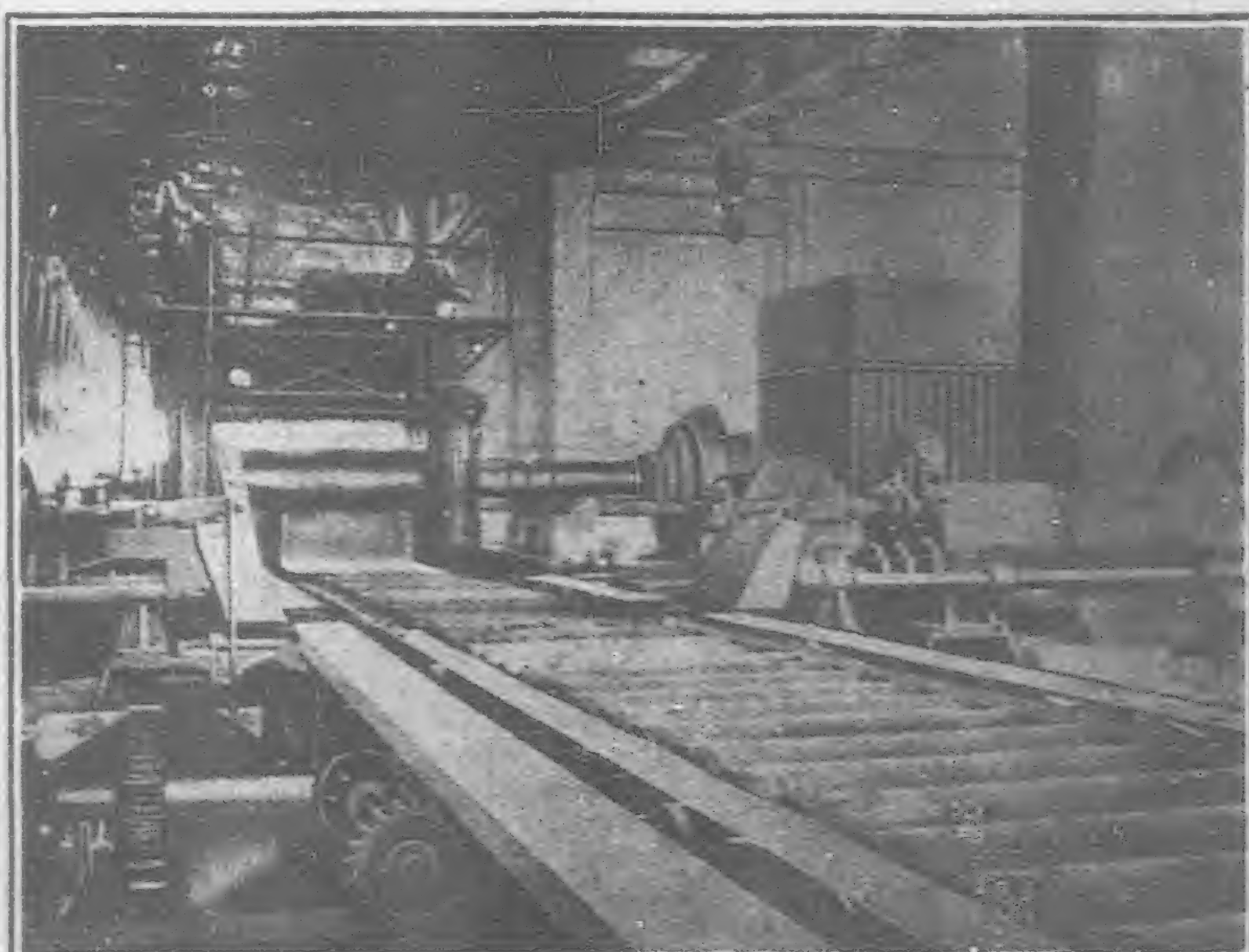
Other mines worthy of mention are those of Akatani, with hematite deposits, formerly worked for copper; the magnetite deposits at Ishikawa; and the magnetite deposits at Nakakosaka, discovered in 1852 and worked intermittently since that date.

Iron Deposits in Chosen

The iron deposits in northwestern Chosen, located near the coast, provide large tonnages of ore, both for smelting in Chosen and for export. They consist of limonite and hematite ores, the former predominating. From 20 to 25 per cent. of these ores are exported to Japan proper and some to Manchuria, the remainder being used in the Korean iron industry at Kenjiho, where pig iron



Charging Side of Open Hearth Furnace



Thick Plate Mill

Mitsubishi Iron and Steel Works at Kenjiho, Korea

is made, principally for shipment to Japan. These ores are readily utilizable in blast furnaces and present no special problems. They are fairly high-grade ores of 50 to 55 per cent. iron content.

The large Mitsubishi interests operating the Kenjiu Iron Works in Kokkaido, Chosen, also own iron mines in this district. At present they receive supplies of limonite from the mines at Kenjiu, Genzan-men, and Nanyo-men. The Korean works also receive ores from the Kaisen mine in the Heiannando district, owned by the Nippon Seikojo.

The Sainei-men mine, owned by the Government, is operated by the Mitsubishi interests and supplies ores to the Government works at Yawata, in Japan proper, and to the furnaces at Kenjiu.

The Rigen Iron Mining Co. operates an important mine, which is reported to have reserves of 10,000,000 tons. The mine is located in Kankyonando, in northwestern Chosen. This ore is hematite, with an iron content of 50 to 55 per cent. Shipping facilities are close at hand and ores are supplied to the Government Iron Works at Yawata and private plants in Japan; 60,000 tons annually going to the former.

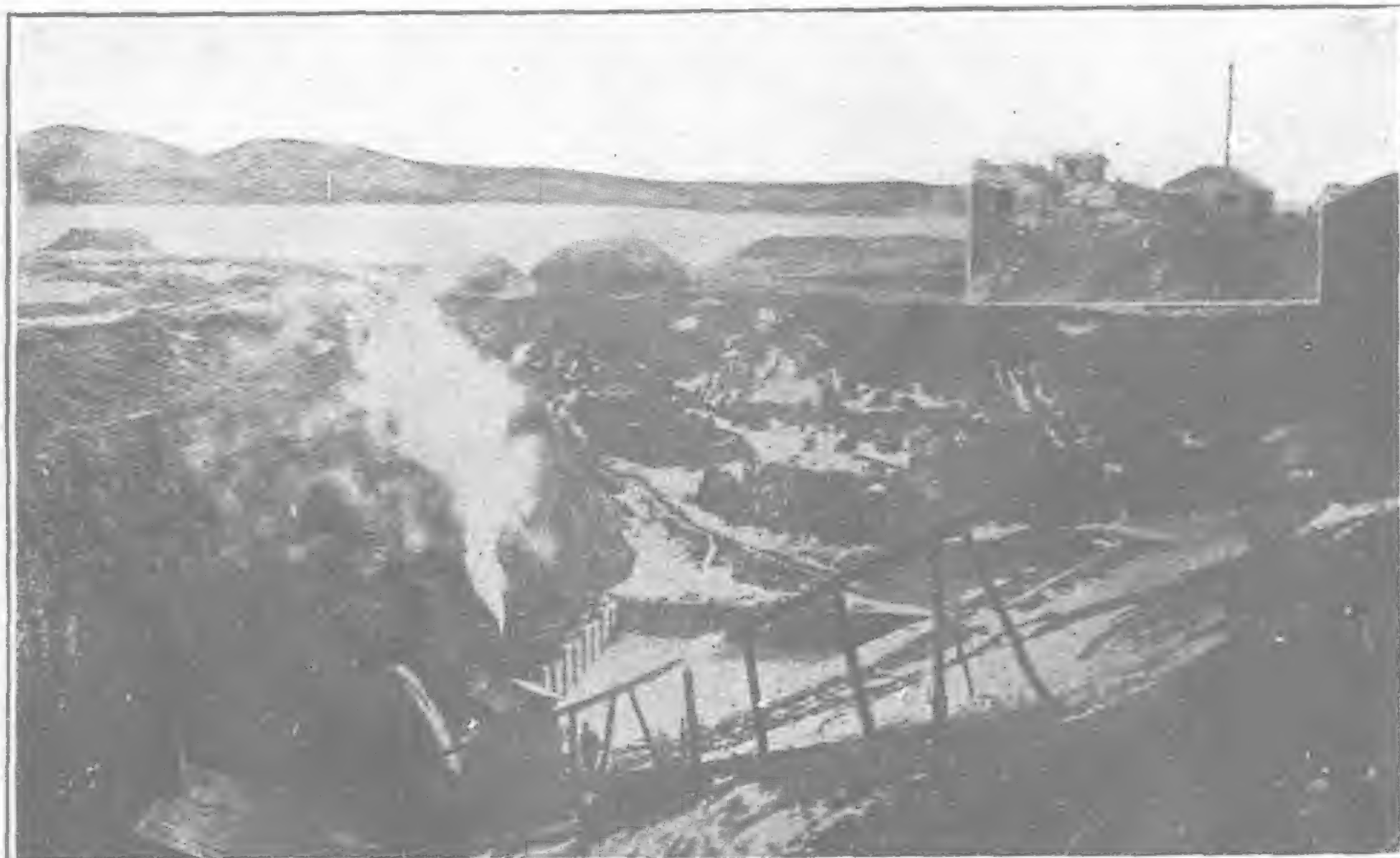
South Manchurian Iron Deposits

The Manchurian iron-ore deposits require separate consideration. In these, there are a few million tons of high-grade ores, together with very large quantities of low-grade ores. The two grades are intermingled, so that the only possible solution of the problem of iron production in Manchuria is the development of the low-grade ores. These low-grade ores are not directly suitable for blast-furnace use, but require preliminary treatment, involving crushing, roasting, and concentration. Inasmuch as these processes require considerable equipment, and since coking coal is available near by, the metallurgical industry based upon these ores should be located in the vicinity of the mines, as long-distance transportation by rail and water of ores of 30 per cent. iron content would prove uneconomical. This means that such ores can not well enter the trade in ores and will not be used as additional supplies for blast furnaces located in Japan proper.

The South Manchurian ore reserves, according to Mr. F. R. Tegengren, are as follows:

SOUTH MANCHURIAN ORE RESERVES—[In thousands of metric tons]

Province	Ore	Iron content	Percentage of iron	Percentage of SiO_2
Kungchangling	268,000	90,000	34	51
Penhsihu.. ..	70,000	25,000	36	46
Anshan	400,000	144,000	36	46
Total	738,000	259,000	..	..



An-ak Iron Mine, Whanghai Province, Korea

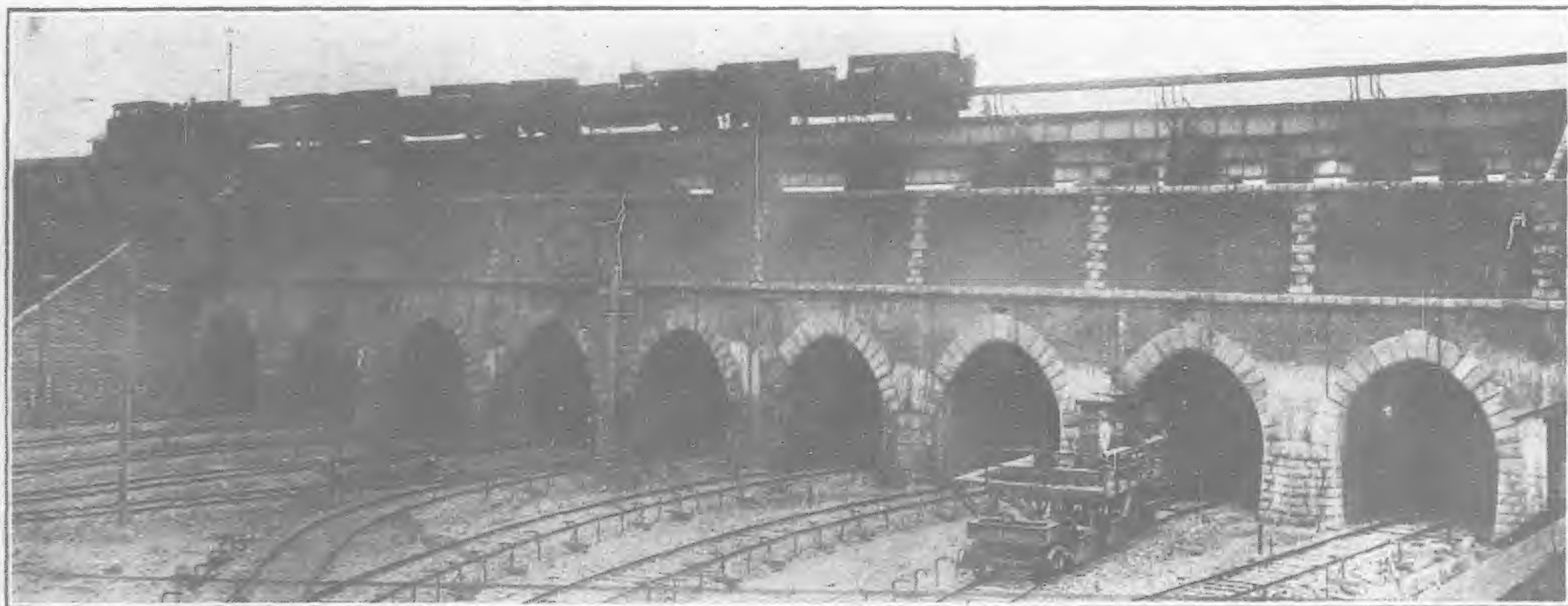
Although the above-mentioned 738,000,000 tons constitutes a very large reserve of ore in comparison with anything found in Japan proper, it is not certain that it can provide the basis for a profitable iron and steel industry under present conditions.

Mr. V. K. Ting estimates the South Manchurian reserves at 287,000,000 tons, with an iron content of 105,000,000 tons.

Production of Iron Ore

The production of iron ore in Japan proper was under 4,000 tons per year in 1875. It reached 10,000 tons in 1878, passed 20,000 tons in 1889, and remained at 25,000 tons from 1895 to 1900. After the establishment of the Yawata Iron Works, the production rose in 1901 to 69,000 tons. In 1905 it jumped to 135,000 tons and reached a peak of 190,000 tons in 1907, then declined somewhat until 1917, when abnormal prices permitted the operation of almost any iron mine. This high production lasted until 1920, reaching a yearly maximum of 379,000 tons in 1917. In 1921 the production abruptly dropped to less than one-third of that for the previous year and is only now slowly recovering.

Operation of most of the mines in Japan is possible when the prices of iron ore reach abnormal levels. Prior to 1917 more than 95 per cent. of the ore mined in Japan proper came from the mines at Kamaishi, Abuta, and Sennin, while in 1920 the production from mines other than those named reached over 70 per cent. of the production of the former. At present (April, 1928) only two mines are being worked intensively.



Ore Depot at the Aushan Iron and Steel Works of the South Manchuria Railway Company



Taiko-Shan Iron Workings of the Anshan Iron and Steel Works, Manchuria

The following table shows the production of iron ore for Japan proper, Chosen, and Manchuria since 1912.

PRODUCTION OF IRON ORE BY JAPAN
(In metric tons)

Year	Japan proper			Chosen	Total Japan and Chosen	Man-churia	Grand total
	Kamaishi mine	Other mines	Total				
1912 ..	130,471	22,512	152,983	122,503	275,486	..	275,486
1913 ..	136,351	16,750	153,101	142,049	295,150	..	295,150
1914 ..	99,515	22,124	121,636	182,034	303,670	..	303,670
1915 ..	79,572	39,383	118,955	209,937	328,892	..	328,892
1916 ..	97,067	42,886	139,953	245,418	385,371	..	385,371
1917 ..	148,421	119,173	267,594	152,933	420,527	103,146	523,673
1918 ..	143,683	234,431	379,114	430,787	808,901	189,357	998,258
1919 ..	115,432	247,517	362,949	417,000	779,949	263,865	1,043,314
1920 ..	131,132	183,726	314,858	447,249	762,107	175,966	933,073
1921 ..	65,133	21,844	86,977	232,692	319,669	206,243	525,912
1922 ..	37,752	1,992	39,744	185,584	225,328	140,128	365,456
1923 ..	53,735	1,439	55,174	306,255	361,429	213,731	575,160
1924 ..	57,236	686	57,922	323,639	381,561	220,105	601,666
1925 ..	53,997	21,768	75,765	376,207	451,972	220,999	672,971
1926 ..	74,993	55,427	130,420	387,717	518,137	586,543	1,084,680
1927 ..	95,858	63,147	159,005	422,560	581,565	630,604	1,212,169

The importance of the production in Chosen and Manchuria is obvious. In 1926 the production in Japan proper was only 12 per cent. of the total production for Japan, Chosen, and South Manchuria. The South Manchurian production was 50 per cent. of the total, although it should be remembered that the Manchurian ores are of much lower iron content than the others. Manchurian

production has always been an important factor in the Japanese iron industry, although the operations of the smelters located there have not always been financially satisfactory. It is probable that if smelting operations are carried out on a much larger scale, they can be made profitable, and hence a great expansion in ore production will be warranted.

Mining in this region is carried on by open-cut methods. The ore is blasted and then broken to size, where necessary, by hand labor. It is loaded into cars of up to 30-tons capacity and hauled to the furnaces. The principal mines are in a zone eight miles in radius about the Anshan Iron Works.

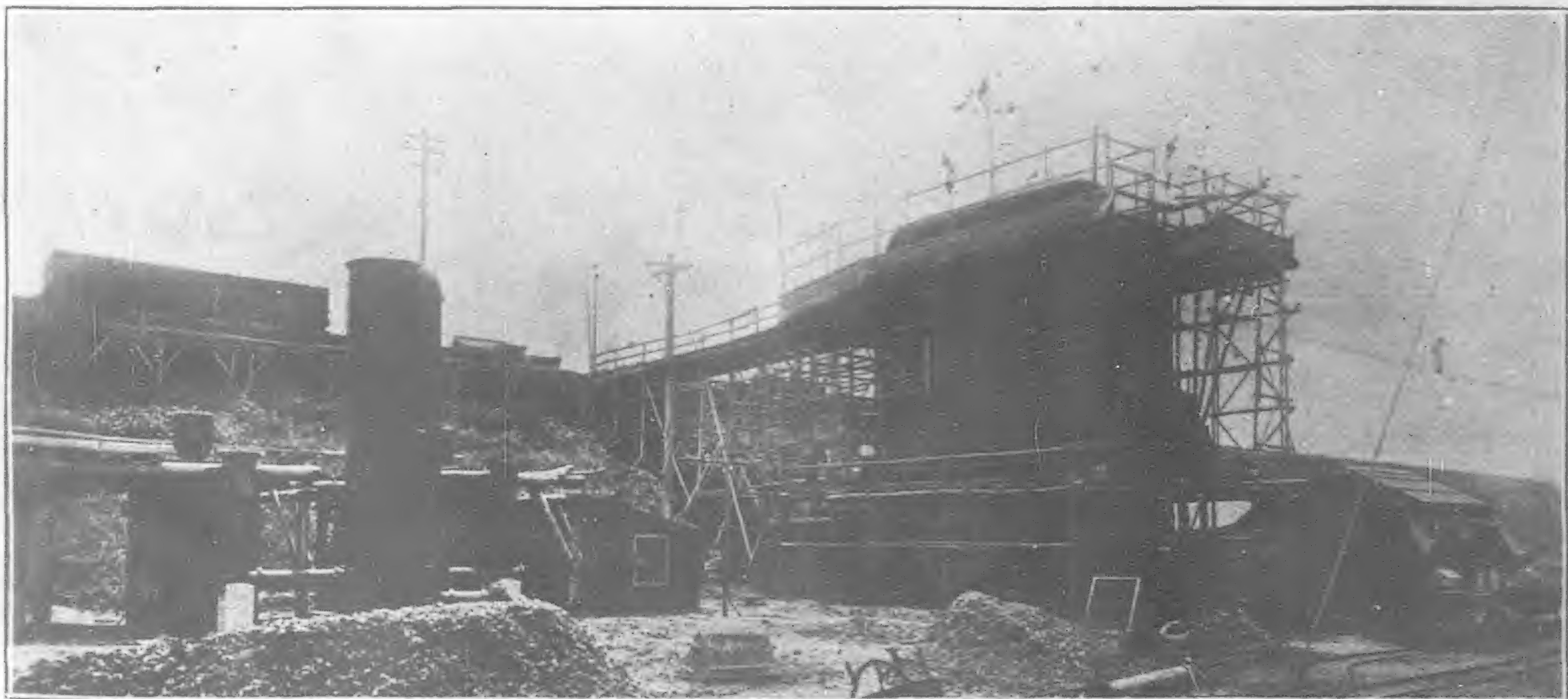
An expansion of operations in connection with the Manchurian mines is expected. The 1926 production is given at over 500,000 tons, which is more than twice the greatest annual production ever recorded previously. Mining operations in connection with the supply of

ores to the Anshan and Pen-hsi-hu Iron Works in South Manchuria are carried on by Sino-Japanese companies under predominating Japanese influence.

The only increases to be expected in the domestic production are from the Kamaishi mine, which is being worked more intensively than formerly, and from certain mines in the Hokkaido, which are being worked to supply limonite to the blast furnaces at Wanishi, and whose exploitation will be carried on more actively as the development of Hokkaido progresses and new areas are served by railway.

The mines in Japan proper are too widely scattered and unfavorably located to be worked intensively. They cover the entire range of the country and are not large enough or favorably enough situated with reference to other basic requirements to warrant the establishment of smelters. Transportation costs are too high to permit the working of the great majority of them in normal times. For example, the Wanishi Iron Works owns a promising mine from which transportation of ore by rail costs Y. 4 per ton, while ores from China cost only Y. 3.50 per ton to transport to their works.

The following tabulation shows the percentage of production in Japan proper to the total consumption, and also the percentage of the combined production in Japan proper, Chosen, and South Manchuria to the total consumption of the three areas, since 1914. It shows conclusively the great importance of the production of ore in Chosen and South Manchuria, and indicates that, including these areas, the Japanese iron industry secures a fair proportion of its requirements from its own supplies.



Experimental Reducing Furnace, 300 Tons Capacity, Anshan Iron and Steel Works, Manchuria

RATIO OF PRODUCTION TO CONSUMPTION OF IRON ORE IN JAPAN

Year	Percentage of production in Japan proper, to total consumption of Japan proper	Percentage of combined production in Japan proper, Chosen, and South Manchuria to total consumption of these areas
1914	21	50
1915	19	51
1916	23	58
1917	39	64
1918	39	74
1919	28	63
1920	24	59
1921	10	48
1922	4	31
1923	5	39
1924	5	36
1925	6	38
1926	13	53
1927	14	56

Kuji Iron Sands

For several centuries the iron-sand deposits of northern Japan have been utilized on a small scale in the making of iron and steel, largely for the production of the swords used by the Samurai of feudal Japan. The deposits occur in many scattered localities, but the one of greatest interest in connection with the present-day iron industry is that located near Kuji, in Iwate Prefecture, on the Pacific coast near the northern end of Honshu, the main island.

The Tokiwa Co., of Tokyo, holds the rights for working these deposits and operates the Kuji Sponge Iron Plant for the reduction of these ores. The mining rights cover an area 17 miles long and 10 miles wide. The deposits run to within six miles of the sea and occur at elevations of from 500 to 1,000 feet. The more readily workable deposits occur at or near the higher elevation. The total reserves are estimated at from 150,000,000 tons to 1,000,000,000 tons, but the recoverable amounts can not be definitely stated. The quantities of ore readily available appear to be quite large enough to justify an industry of the dimensions proposed.

These ancient beach deposits occur in horizontal beds 10 feet or more in thickness, some of which are within 10 feet of the surface, with much larger amounts at about 30 feet from the surface. Although most of the mining is underground, the operation of some open-cut mines would seem to be entirely feasible, and a logical operation if the project is to be developed on a large scale. A small open cut is now being worked as an experiment.

The sands contain magnetite and limonite particles. The iron content of samples has ranged from 23 per cent. to 60 per cent. The ore carries up to 12 per cent. of TiO_2 (titanium dioxide.) Large quantities of the ore of 45 per cent. to 50 per cent. iron content, with magnetite and limonite in about equal proportions, are found. The ore thus far mined has averaged from 35 per cent. to 40 per cent. iron content. It is reported that about 25,000 tons were mined during 1926 and 1927.

The two mines now being worked are located nearly 1,000 feet above sea level. The sponge iron plant is located at approximately sea level, about five miles away. The ore is dropped in two chutes from a height of 700 feet and then transported in cars drawn by small gasoline locomotives.

The first attempt to make use of these sands as a part of the present iron industry in Japan was by smelting in a blast furnace. This did not prove entirely successful and the furnace was closed down.

The present practice consists of the reduction of the ores by the Anderson-Thornhill process. This process was developed from a method used for copper metallurgy, the essential part of which consists in the direct reduction, in a highly reducing atmosphere, of the ores at temperatures well below the point of fusion. After being so reduced and then passed through cooling cylinders, the spongy product from the hearth is passed over magnetic separators, where the metallic material is separated from the waste. The titanium compounds remain with the iron, as do some of the siliceous materials.

The finely powdered iron is pressed in briquets without the use of any binding material. These briquets are four inches in diameter and five inches long, although some are made four inches in diameter and 3½ inches long. They are then ready for shipment to open-hearth furnaces.

No entirely reliable information has ever been presented relating to the success of the process. The existing reports emanate from parties interested in or responsible for some phase or other of the process. It is generally admitted that the problem of producing this type of iron as an essential part of the Japanese iron industry has not yet been solved. It should not be assumed, however, that the process is a failure. It is new and hence must necessarily experience many difficulties common to the preliminary stages in the development of all new processes.

There are several possibilities of making the iron-sand product entirely usable. Excellent results have been obtained by making steel from it in an electric furnace, and the establishment of an electric furnace at Kuji or elsewhere would seem to be a logical step, if the material can not be made available directly for open-hearth use. Second, there is a small blast furnace at Kuji which was used before the sponge-iron plant was erected. An improved commercial product could be made by remelting the briquets in this blast furnace and so producing pig iron. Further, in the blast furnace process it would be possible to remove some of the titanium.

Trade in Iron Ores

Obviously, Japan proper, with a pig-iron production of 800,000 tons per year, must place great dependence on ores from other countries, so that the trade in ores is more important than the production in Japan proper. Chosen supplies a considerable quantity of the 388,000 tons produced in Japan. In 1926, 99,000 tons were sent to Japan, although Chosen itself imports some ore from China (hematite from the Yangtze Valley.)

The Yangtze Valley, in central China, and the Malay States supply the ores imported into Japan from foreign (non-Japanese) sources. The large scale importation from the Straits Settlements of Malayan ores is a development begun in 1921, the iron resources of Malaya being exploited by Japanese interests which hold mining concessions. The ores consists of very high-grade hematite and magnetite. China has for many years furnished Japan with iron ore, a high-grade hematite, from the Yangtze Valley, and Japanese interests exert either direct or indirect influence through financing in this ore production.

The following table shows the consumption of ore in Japan :

IRON-ORE CONSUMPTION IN JAPAN PROPER					
Year	Production in Japan proper	Imports	Total supply	Percentage of production to consumption	
	Tons	Tons	Tons		
1913	153,101	422,316	575,417	27	
1916	139,953	470,016	609,969	23	
1922	39,744	908,337	948,081	4	
1923	55,174	988,650	1,043,824	5	
1924	57,922	1,201,859	1,259,781	5	
1925	75,765	1,211,577	1,287,342	6	
1926	130,420	891,822	1,022,242	13	
1927	159,005	1,115,420	1,274,425	14	

The falling off of the imports in 1926 was due to the decline in supplies from the Yangtze Valley.

In the foregoing table the ore coming from Chosen is included in the imports. The amounts produced and used to produce pig iron in South Manchuria and Chosen do not enter into the tabulation, however,

The 1926 consumption does not indicate actual demand during that year, since large quantities were obtained from stocks on hand, and reserves were seriously depleted. The present demand is about 1,500,000 tons per year.

The following table shows imports into Japan proper, and hence does not deal with Manchurian ores, nor does it show the inconsiderable imports of Chinese ore into Chosen or the small exports from Chosen to Manchuria.

The Chinese ores are almost entirely from the Yangtze Valley, with occasional small amounts from Shantung Province. The 1924 and 1925 importation from China shows the great reliance that is normally placed on Chinese ores as a source of supply for the Japanese iron industry, the importation from the Yangtze Valley in 1925 being 67 per cent. of the total consumption of iron ore in Japan proper during that year. The imports from China for 1926 and 1927 show how serious has been the decline in the supplies from China caused by the internal disturbances there.

The foregoing table shows the sources of imports of iron ores.

The figures for the Straits Settlements reveal some interesting developments. Japan is depending increasingly on supplies from

IRON-ORE IMPORTS INTO JAPAN BY COUNTRIES OF ORIGIN
Quantity in metric tons ; value in thousands of yen

Year	China		Straits Settlements		Others		Total		Chosen		Grand total		Average (approximate) price in yen per ton delivered Japanese port
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
1912 ..	195,625	1,101	—	—	2,586	77	198,211	1,178	123,405	636	321,616	1,815	5½
1913 ..	277,883	1,537	—	—	2,013	48	279,896	1,585	142,420	724	422,316	2,309	5½
1914 ..	297,183	1,671	—	—	1,685	58	298,868	1,729	162,044	832	460,912	2,561	5½
1915 ..	308,074	1,786	—	—	714	26	308,788	1,812	201,978	1,045	510,766	2,857	5½
1916 ..	279,216	1,641	—	—	575	30	279,791	1,672	190,225	1,016	470,016	2,688	5½
1917 ..	295,688	2,382	—	—	1,193	77	296,881	2,459	120,907	961	417,788	3,420	8
1918 ..	359,698	9,601	—	—	1,232	73	360,930	9,674	236,611	4,822	597,541	14,555	24
1919 ..	595,140	15,331	—	—	25,946	808	621,086	16,139	333,521	2,340	954,607	18,479	19½
1920 ..	650,527	14,373	—	—	11,841	524	662,368	14,897	332,533	3,358	994,901	18,255	18½
1921 ..	439,769	7,266	—	—	138,287	2,817	578,056	10,083	190,541	1,702	768,597	11,785	15½
1922 ..	644,730	6,622	—	—	173,780	2,801	818,510	9,423	89,827	768	908,337	10,191	11
1923 ..	661,796	4,855	163,441	1,738	68,023	709	893,260	7,302	95,390	726	988,650	8,027	8
1924 ..	800,157	6,110	264,933	2,844	42	4	1,065,132	8,958	136,727	995	1,201,859	9,952	8½
1925 ..	813,490	6,299	290,213	3,142	6	—	1,103,709	9,441	107,868	919	1,211,577	10,360	8½
1926 ..	502,747	4,002	290,053	3,188	30	1	792,830	7,191	98,992	773	891,822	7,964	9
1927 ..	506,806	4,264	438,450	4,804	—	—	945,250	9,073	170,170	1,085	1,115,420	10,158	9

Note.—The par value of the yen in United States currency is \$0.4985. The average value of the yen in 1921 was \$0.4825; 1922, \$0.4780; 1923, \$0.4858; 1924, \$0.4119; 1925, \$0.4104; 1926, \$0.4712; and 1927, \$0.4741.

this region, the 1927 imports being nearly equal to those from China for that year. Although not so recorded in this table, 134,000 tons were imported from the Straits Settlements in 1921 and about 170,000 tons in 1922, these amounts being classified under "Others." Similarly, in 1923, most of the 68,000 tons credited to "Others" is actually Malayan ores from the Straits Settlements, the Japanese records for this year being uncertain, owing to the earthquake disaster.

From 1919 to 1921 small quantities of Manchurian ores were imported. In 1919 about 20,000 tons were received from the Philippine Islands. For some years prior to 1920, from 1,000 to 2,000 tons were shipped from Australia.

It is of interest to classify the total ore supplies of Japan with reference to the Japanese influence on the production. The following tabulation shows the sources so classified, both for Japan proper and for the combined areas of Japan proper, Chosen, and South Manchuria.

JAPANESE SOURCES OF ORE SUPPLIES

[Figures are for 1926 and are in thousands of metric tons]

Source	Supplied for the iron industry of Japan proper	Supplied for the Japanese iron industry in Japan proper, Chosen, and South Manchuria
Japan proper	130	130
Japanese territory outside of Japan	170	388
Japanese leased zones	—	566
Japanese mining concessions in foreign countries	438	438
Mines under Japanese financial influence	507	507
Total	1,245	2,029

Practically no ores were imported from sources in which there was not some Japanese interest. The thoroughness with which the Japanese have built up sources of supply from Asiatic ore properties is indicated by iron-ore imports. The imports have nearly quadrupled in the past 16 years, and Japanese interests have increased the production of all the areas they have entered and have been able to insure an increasing supply, despite the fluctuations in certain individual sources of supply. This is notably the case in connection with the serious breakdown in the Chinese supplies since 1926, owing to internal political upheavals. During 1926 great reserve supplies in Japan were built up, but by 1927 imports had been brought back nearly to normal by increasing the supplies from Malaya and Chosen.

Non-Japanese Sources of Japanese Iron-Ore Imports

It is of interest to consider briefly some of the sources which have been such important suppliers of Japanese ore requirements. The Chinese Provinces of Hupeh and Anhwei are the principal localities from which Japan secures ores from that country. The Province of Hupeh has an estimated reserve of about 35,000,000 tons of ore of from 54 per cent. to 60 per cent. iron content. In this Province are located the Tayeh mines of the Han-Yeh-Ping Co., with which Japanese interests are closely allied. These mines have

an estimated reserve of over 10,000,000 tons of hematite ore of about 60 per cent. iron content. Anhwei Province has an estimated reserve of 15,000,000 tons of 52 to 60 per cent. ores. In this Province are located the Tai Ping and Tao Chung mines, from which Japan also obtains considerable supplies.

The Tayeh mines, in their present state of development, can furnish 600,000 tons of ore annually to Japan, in addition to supplying the needs of the Han Yang Iron Works at Hankow, China (when this last is operating), which is worked by the Chinese company owning the mines.

The Tayeh mines supply ore to the Government works at Yawata (Kyushu), the Kamaishi Mining Co. works (northern Honshu) as well as to the Wanishi Iron Works, in the Hokkaido, and the Kenjiho Works, in Chosen.

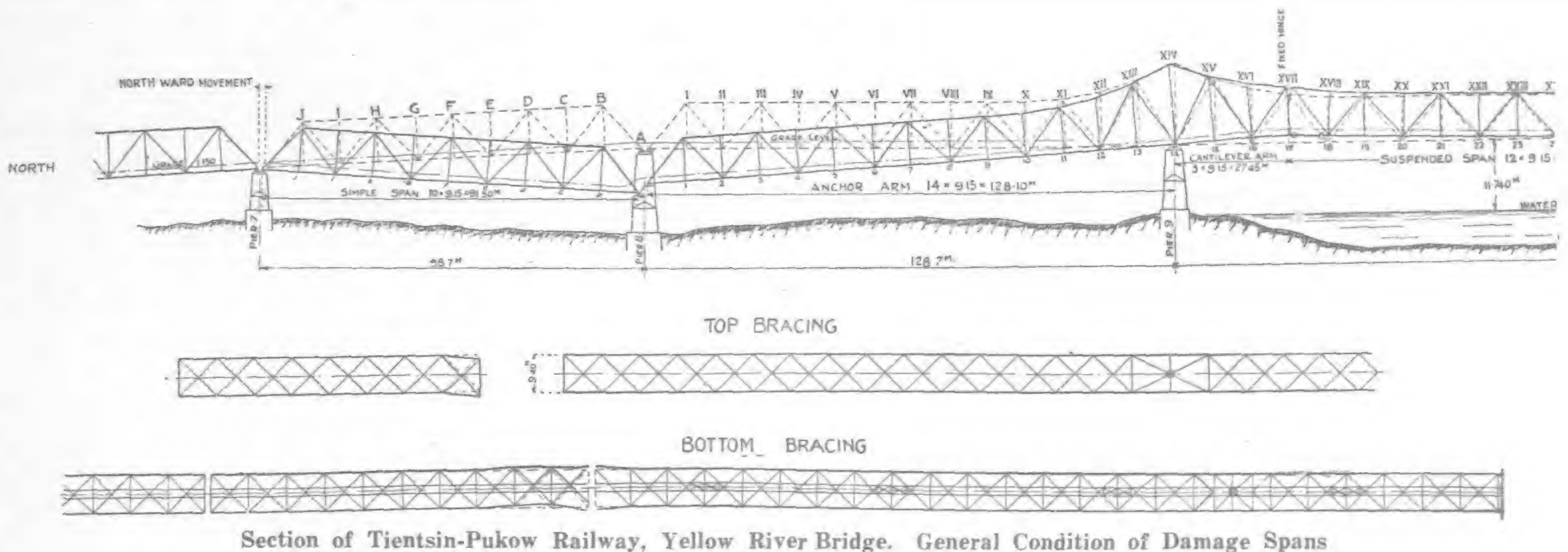
The Tao Chung mine, Anhwei Province, China, has reserves of 3,750,000 tons of 61 per cent. ore (this mine is known as the Tochu mine in Japan, this being the Japanese pronunciation of the two characters which are read "Tao Chung" in Chinese). The mine is operated by a Chinese company called the Yuhan Co., which has been granted a loan of Y. 2,500,000 by the Sino-Japanese Industrial Co., which in turn obtained the funds from the Toyo Iron Manufacturing Co. The Yawata Iron Works is reported to have taken over the buying contract which the Sino-Japanese Industrial Co. held and is further prospecting the deposits. The Moling-Kuan mines, near Nanking, China, also supply ores to Japan. A loan was made by Okura & Co. to the company operating this mine. The Chinglingchang mines in Shantung Province were opened and worked by Japanese interests. They are reported to contain about 14,000,000 tons of 55 per cent. ore.

The Malay Peninsula has proved an increasingly important source of iron ores for Japan, and it is expected to take a part of even greater importance in the future. Since 1921 considerable amounts of ore have been coming from this region, largely from the mines operated by the Nanyo Koshi, a Japanese company having a concession in the State of Johore. These mines have supplied up to 400,000 metric tons of high-grade ores in a year.

The Kuhara Mining Co. has obtained a 50-year lease, commencing in 1927, for iron-mining properties in the Province of Tregganau, in the Malay Peninsula. The ore reserves of these properties are estimated at 40,000,000 tons, the iron content ranging from 58 to 66 per cent, sulphur 0.2 to 0.3 per cent, phosphorus being under 0.04 per cent, and silica about 2 per cent. All the ores are to be sold to the Yawata Steel Works, shipments to commence in 1929 and to continue for 20 years. The proposed amounts of shipments are as follows: 1929, 100,000 tons; 1930, 150,000; 1931, 250,000; and after 1931, 250,000 to 300,000 tons annually.

There are iron-ore deposits of high-grade hematite in the Philippine Islands, from which about 20,000 tons were sent to Japan in 1919. Prominent among these are the Calambayungan and Larap deposits, estimated at 3,000,000 tons, low in phosphorus and sulphur and of about 63 per cent. iron content. At present there are difficulties in the way of exporting iron ores from the

(Continued on page 24)



Rebuilding of The Yellow River Bridge

By Alfred Batson

THE Yellow River Bridge at Luckow on the Tientsin-Pukou Railway a short five miles above the important trade center of Tsinan is the longest cantilever bridge in the Far East and one of the longest in the world. It is a steel structure consisting of a cantilever bridge 422.1 m in total length with eight approach spans of 91.5 m simple trusses at the North end and one at the South end. The total distance between the abutments is 1255.2 m.

The arrangement of spans of the cantilever structure with the provision for expansion may be represented by the following diagram:

North anchor span 128.1m	N can arm 27.45	Suspended span 109.8m	S can arm 27.45	South anchor span 128.1m
-----------------------------	--------------------	--------------------------	--------------------	-----------------------------

Channel span
164.7m

The cantilever structure is level but the approach spans are on a grade of 1:150. The rail level is about eight meters above the high water mark and 12 meters above the normal water level.

The width of the bridge is 9.4 m between the centers of trusses which is enough for a double track, but only a single track is now provided midway between the trusses. Another can be added whenever traffic warrants.

The bridge was fabricated and erected by Maschinenfabrik Augsburg, Nurnberg A. G. Germany. The work was started in August 1909 and completed in October 1912. The cost including superstructure was 12 million marks (about six million Chinese dollars).

The following figures on the various ratios will be of interest:

Channel span 540
Anchor span 420
Ratio of anchor arm to channel span .778
Ratio of suspended span to channel span .667
Ratio of cantilever span to anchor arm .214

When the Northern Army in the recent Chinese civil war retreated to their strongholds

in the interior it was only natural that such an important avenue of pursuit by the Nationalist forces should be removed and bombs were blown under one of the piers holding an anchor arm of the cantilever. The damage can be seen in the accompanying photographs and the slightly enlarged blueprint drawing printed herewith gives a still better idea of what damage the bridge suffered.

Following the complete capitulation of the armies of Chang Tao-lin the Nationalist government made rapid strides toward the immediate repair of the Yellow River bridge but were hampered in their work by the much discussed "Tsinan Incident" of May last which brought the Japanese forces to a military control over the area and further repairing of the structure was prohibited by the Japanese officials.

Nevertheless the Chinese government had already sent competent engineers to the scene and from the report made by them and transmitted to the Government, the following details of the necessary equipment with estimated costs was taken.

Structural Units to be Renewed

Bottom Chord of East and West Trusses:—At the North end of the North anchor arm the outer leaves of the bottom chords of both trusses are disconnected from the gussets and bent outward to clear off pier top. These two chords should be taken off at nearest spliced point and new sections put in place.

END FLOOR BEAM:—This member received the heaviest damage from the explosion. When it was suddenly dropped down on the pier top after the bridge shoes were blown away the web plate buckled in several places with the flange angles totally distorted. This member will have to be replaced anew.

BRIDGE SHOE:—The entire shoe under each of the two trusses was blown off the pier into pieces and needs to be replaced. This includes two sets of castings and rollers.

GUSSETS AND DETAILS:—The gusset connections at the panel points 0 were damaged to such an extent that new plates and diaphragms must be put in for connections with the new bottom chord and floor beam.

OTHER MEMBERS AND DETAILS:—In addition to the above the following members and details were also damaged: Two stringer brackets at panel point 0, the bottom bracings



Jacking Up the Damaged Section of the Bridge



The Break on the Bridge

and lateral plates in the North end panel, one set of new details for the top bracing at panel point XVII, two trolley I beams for the end panel with bracket plates.

Structural Parts to be Repaired

END POSTS OF EAST AND WEST TRUSSES:—The end post of the West truss at panel 0 remains apparently in good condition, but in the East truss the lower part of the bottom flange has its outstanding leg curled up to a slight curvature with the minimum deflection of 70 mm in a distance of 500 mm. The flange angle should be straightened out and the leg angle replaced if necessary.

STRINGERS AND CONNECTIONS:—The stringers in the end panel of the anchor arm seem to be in perfect condition but the connecting angles to the end floor beam should be closely examined after the latter is taken down. The top gusset plate on the West stringer at the end floor beam connection should also be replaced together with the bracing angle connected thereto.

As the only work going on at present is of a temporary nature due to alleged interference by the Japanese military and as the tenders for the permanent replacement steel have not yet been placed but must obviously follow shortly, the following engineer's account of the "Structural Steel to be Ordered" is of especial interest:—

For the cantilever spans:

- 1 end floor beam at panel point 0
- 2 end stringer brackets
- 2 cast steel expansion bearings complete
- 4 gusset plates at panel point 0 with two pedestals.
- 2 lower chords from end gusset plate to first splice
- 2 trolley I beams from end to first splice point with necessary connecting brackets.
- 2 lower horizontal bracings in the end panel with two bottom gusset plates.

1 set of new details for top bracing system at panel point XVII

For the damaged simple span:—

- 1 end floor beam at panel point "a"
- 1 intermediate floor beam at panel point "b"
- 2 end stringer brackets
- 2 fixed bearings complete
- 4 gusset plates at panel point "a" with two pedestals
- 2 lower chords from end to first splice point
- 2 stringers
- 2 lower horizontal bracings in the first panel
- 2 " " " " " second "
- 1 " " " " " third "

- 2 bottom bracing gussets at panel point "a" (east truss)
- 1 " " " " " " " " " "b"

OTHER SPANS

- 1 portal strut for South end of span No. 2
- 1 knee brace for North end bridge entrance portal Field Rivets and Turned Bolts.

Order necessary number of field rivets for the above members. For the undamaged joints of the North anchor arm and simple span, order 20 per cent. of the total number of rivets in these joints.

Estimates

(a) LIFTING

Item 1.—Timber bents—			
Timber for trestle bents, 20,000 b m @ \$110 ..	\$2,200		
Timber for base bents, 20,000 b m @ \$110 ..	2,200		
Iron fittings, etc.	200		
Carpenter	100	\$4,700	
" 2.—Preparation of foundation—			
Loosening, excavating and ramping 100 m ³ @ \$2	200		
Sand, gravel 100 m ³ @ \$2.50	250	450	
" 3.—Jacking equipment and accessories—			
Ten 100 t screw jacks @ \$700 each	7,000		
Four 50 t screw jacks @ \$500 each	2,000		
I beams, slabs, etc., 20 t @ \$150	3,000	12,000	
" 4.—Jacking labor—			
2,000 workmen days @ \$2	4,000	4,000	
" 5.—Necessary scaffolding	2,000	2,000	
" 6.—Overhead 20 per cent.	4,650	4,650	
	Total ..		\$27,800

(b) PROVISION FOR TRAFFIC

Item 1.—Timber bents 30,000 ft. b m @ \$110 ..	\$3,300		
Iron fittings	500		
Carpenter labor	400	\$4,200	
" 2.—Sleeper stack —			
5,000 pieces sleeper @ \$3	15,000		
Iron fittings, \$300, labor \$200	500	15,500	
" 3.—Preparation for foundation—			
Loosening, excavating and ramping 300 m ³ @ \$2.00	600		
Sand and gravel 300 m ³ @ \$2.50	750	1,350	
" 4.—Structural Steel			
I beams 24 tons } 30 tons @ \$200	6,000	6,000	
Details 6 tons }			
" 5.—Erection labor 30 tons @ \$30	900	960	
" 6.—Overhead 10 per cent.	2,850	2,850	
	Total ..		\$30,800

(c) REPAIRING

Item 1.—Clearing off Pier top—			
85 m ³ for clearing and chiseling @ \$5	\$425		
" 2.—Remodeling of pier top—			
2 bed stones @ \$20 each	400		
85 m ³ of masonry @ 30 per m ³	2,500	\$2,950	
" 3.—Dismantling of Steel Work—			
70 tons of steel @ \$25	1,750	1,750	
" 4.—Fabricated steel—			
70 tons of steel @ \$500	35,000		
10 tons of steel casting @ \$600	6,000	41,000	
" 5.—Rental for erection plant and tools	10,000	10,000	
" 6.—Erection and repairing 70 tons steel @ \$70 ..	7,000	7,000	
" 7.—Yoke and wire rope provision at joint XVII ..	1,500	1,500	
" 8.—Repairing of side walks	2,000	2,000	
" 9.—Repairing of inspection trolley	3,000	3,000	
" 10.—Painting	500	500	
" 11.—Readjustment of riveted joints	10,000	10,000	
" 12.—Contingencies 10 per cent.	8,075	8,075	
	Total ..		\$88,200

SUMMATION

(a) Lifting	\$27,800
(b) Provision for Traffic	30,800
(c) Repairing	88,200
(d) Supervision	5,000

Total \$151,800

LESS SALVAGE VALUE

(e) Lumber	3,800
(f) Sleeper	10,000
(g) Steel	1,000
(h) Tools and equipment	7,000

\$21,800

Total .. \$130,000

The hope of the engineers in charge is that permission can be received from the Japanese to complete the work permanently in time for the September floods and in view of the situation now prevailing anent the Yellow River Bridge and the held locomotives and cars at the workshops the steel tenders may be made public sooner than expected.

At the same time the Japanese military are holding at the Tsinanfu yard of the Tientsin-Pukou Railway some 47 locomotives and 488 odd mixed goods and passenger cars belonging to this line and certain others, that were used by the various armies operating in this area until unfit for further use when they were run in the yards and deserted.

There the rolling stock remained until the situation of May third (the Tsinan Incident) when the Japanese established a military zone around the territory and have refused the line permission to repair the stock at its own yards in Tsinanfu, or take it to the headquarter shops at Pukou.

For the locomotives it can be said that they are a mixed conglomeration of various types and sizes. Many are of the well-known Mikado first class type and badly needed by the line to power goods along its tracks, others are small shunting engines that are likewise needed in the usual course of yarding and for short hauls.

This reporter was one of the party of railroad officials who approached the Japanese on the possibility of releasing the stock and on investigation of the stock standing for the past several months (since May) in the open yards the findings beggar description.

Not a waste box could be found that was even damp with oil. Axles in the general run of the locomotives were in almost every case rusted to such an extent that when repairing does start it will be several months before any considerable amount of the stock will be fit for general use. Boilers in many cases were left half filled and the rusted water has accomplished the usual results. Many have not been blown out since the regular trainmen were replaced at the throttles by the embryonic coolie-soldiers.

In several instances birds were found nesting in the cabooses and in short the scene presented many aspects of a humorous



How the Bridge is Jacked Up

touch that were beyond the most vivid imaginations of fictionists.

As for the cars, they are the leavings of that odd and unusual caravan known as a Chinese army. Lavatories in many cases gave way to the indisposition to trouble oneself to walk to the end of the cars. Fires had been lighted in the centers of several first class coach floors and rifle marks and sabre cuts were everywhere. Benches in the second class compartments were oftentimes torn down to provide fuel for the fire that had left its mark on the floor a few feet away, hardly a window in the whole lot was left intact, wiring was usually pulled out out of pure maliciousness and the famed "Blue Express" once the crack train of this line and the Far East was represented by several coaches whose deep and luxurious interior was the especial butt of the coolies' playfulness.

In one instance a fire had evidently been carefully kindled in an arm chair and when one burned itself through to the floor another was started in the adjacent resting place. The rich woodwork was the target of bayonet and sabre thrusts without number and the sleeping coaches were obviously used for more intimate purposes.

The only equipment which seemed not to suffer was the steel coal cars in which was moved the cavalry and it can be thought that this was due to the occupants being horses and not soldiers.

However with the consent of the Japanese the railway officials hope to start work on repairing as much as possible what equipment shows promise of being salvaged.

The method followed in raising the bridge to its former height is by the building of wooden sleeper structures underneath atop of which are placed batteries of Joyce jacks. As the jacks maximum extension is reached, the space gained is secured, additional timbering is placed underneath, and the operation repeated.

Japan's Iron and Steel Industry, I

(Continued from page 21)

Philippine Islands, and these mines are not in operation, but during the past year the feasibility of working these mines for the sale of ores to Japan has been considered.

During the present year an Australian iron-mine owner has endeavored to negotiate for the development of a mine on an island off the coast of Australia and for the sale of ores to Japan. These ores are said to have a 69 per cent. iron content.

Ore-Supply Program

One of the most pressing problems of the Japanese iron industry is the formulation of a definite policy relative to ore supplies. The Ministry of Commerce and Industry is giving consideration to the matter on the basis of a report by the president of the Government Steel Works. It is planned to purchase 2,600,000 tons of ore during the coming two years. The falling off of imports in 1926 depleted reserves, which are now low, probably about 800,000 tons being on hand.

The problem consists primarily in assuring a continuous and ample supply for the Yawata Steel Works, which consumes the greater part of the ores imported from China and practically all of those imported from Chosen and Malaya.

The Yawata Works states that its requirements for the coming fiscal year amount to 1,350,000 tons. The sources of ores for the fiscal year 1927-28, as well as for the following fiscal year, are shown below:

SOURCES OF IRON ORE FOR THE YAWATA STEEL WORKS

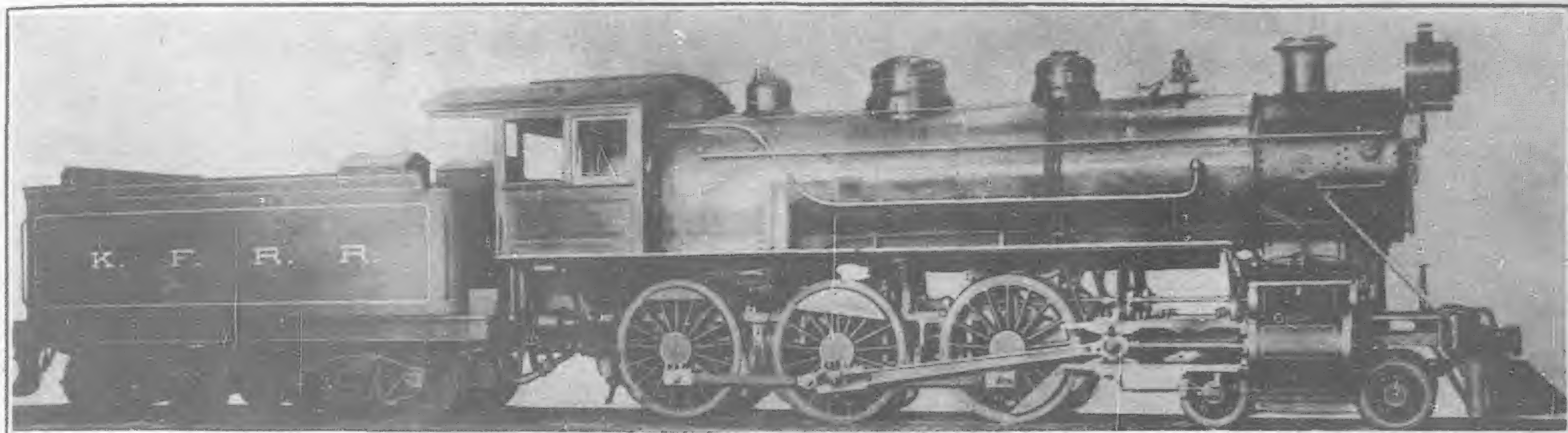
[In thousands of tons]

Sources	Fiscal year	
	1927	1928
Tayeh mines, Hupeh Province, China	355	400
Taochung mines, Anhwei Province, China	175	300
Johore, Straits Settlements	470	350
Chosen	222	200
Other	48	50

Ore is delivered to the Yawata Steel Works from China by the Nippon Yusen Kaisha and Mitsubishi Bussan Kaisha, in steamers carrying general cargo in addition to ores. The Yawata Steel Works also owns four special vessels for transporting these ores. The Nanyo Koshi, which operates the mines in Malaya, owns special ore-carrying steamers carrying ore supplies to the Yawata Steel Works.

Most of the ores are sold directly without the intervention of trading companies, by virtue of long-time sales agreements between mining companies and the iron-producing companies. Ores from some of the smaller mines are handled in part by Japanese importing firms, the most prominent of which is Jempei Ishihara & Co., of Osaka.

There is a fairly continuous flow of ores to the furnaces throughout the year, although the Malayan shipments cease during the winter rainy season, and the Yangtze Valley shipments are suspended from December to February.



Type of Baldwin Locomotive Supplied to the Chosen Government Railways

Chosen Government Railways

OCTOBER of last year saw the formal opening of the Kankyo Railway in Korea, a line destined to play a great rôle in the development of Northeastern Korea and the Manchurian hinterland. The necessity for constructing this line was recognized by the Japanese when they first took over control of Korea, but it was not until 1913 that work was started along the coast from Gensan to Seishin. Not only is the railway an essential one for developing the resources of regions served by it, but it plays an important part in the defense plans of Japan itself. It has taken fourteen years of work and an expenditure of over Y.90,000,000 to complete the line which now makes possible through traffic between Seoul, Gensan, Seishin, Ranan and Kwanei on the Manchurian border. Here, it will connect with the new Manchurian lines that must find a deep-water outlet at one of the northeastern Korean ports. Great difficulties were encountered in the construction of the line. Intense cold precluded work during the winter months and the rugged nature of the country, storms, floods and other calamities, combined with financial difficulties, all contributed to delay completion of the line.

Starting from Jinsen or Chemulpo on the west coast of Korea, it is possible for the traveler to cross the peninsula by rail to Gensan and thence northwards through the South and North Kankyo Provinces and arrive at the extreme eastern Manchurian border, a distance of nearly 500 miles. Beyond this point, the light railway will make connection with those of Chientao and East Manchuria at the Kamisambo station where an International Bridge has been built over the Tumen River connecting Korea and Manchuria.

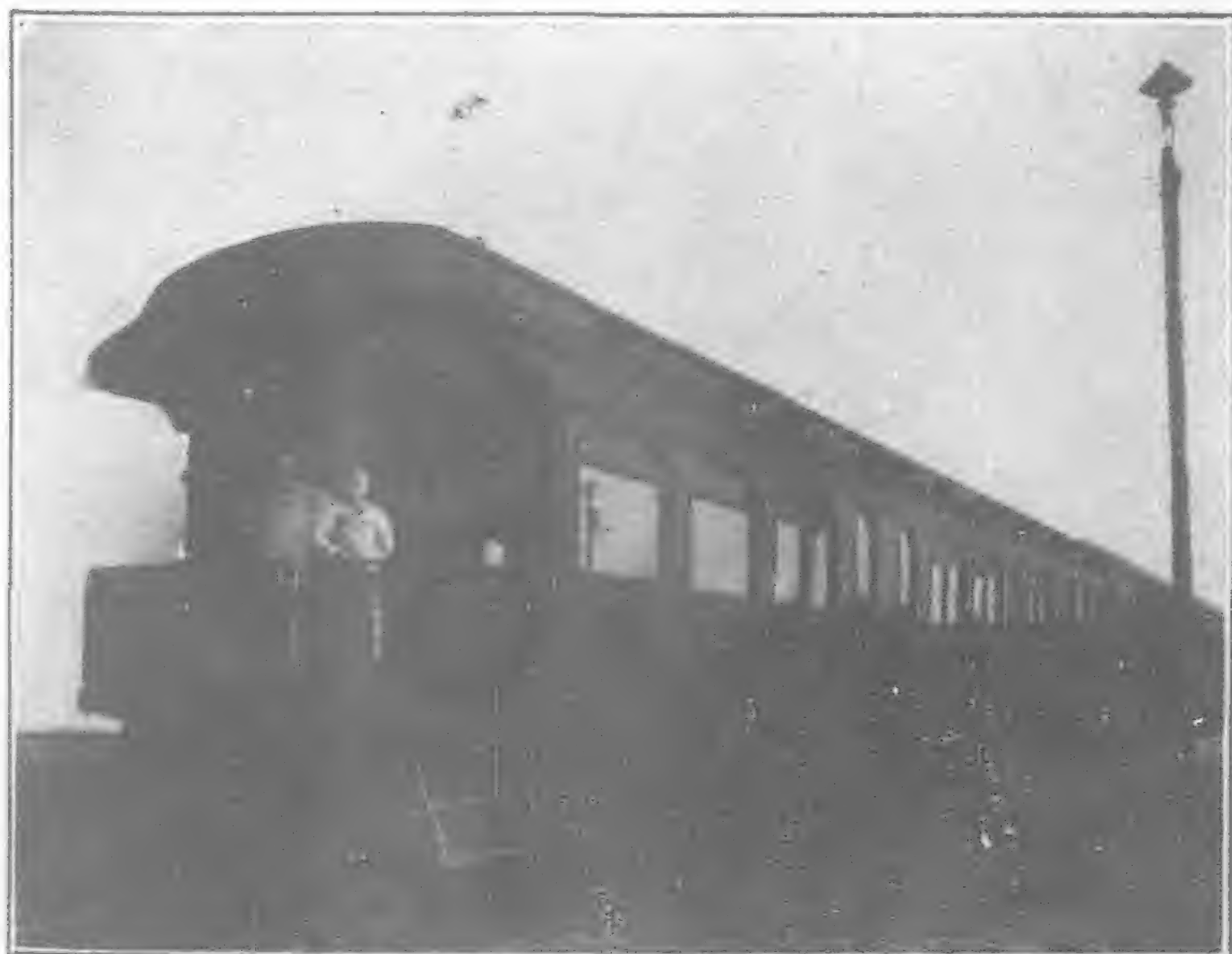
The completion of the Kankyo Line brings the total length of the State Railways of Chosen to nearly 1,500 miles. There are, in addition, 503 miles of private lines in operation, a total mileage for the whole country of about 2,000 miles.

Mileage of State Lines

The State Lines open to business on March 31, 1927, were as follows:—

Fusan to Keijo	..	..	..	..	280 miles
Sanroshin-Masan	..	..	..	..	24 "
Shogen-Chinkai	..	..	..	..	12 "
Eitoho-Jinsen	..	..	..	..	19 "
Keijo-Anto	..	..	..	..	310 "
Koshu-Kenjiho	..	..	..	..	8 "
Daidoko-Shokori	..	..	..	..	14 "
Heijo-Chinnampo	..	..	..	..	34 "
Mochuri-Hakusen	..	..	..	..	5 "
Shinoisho-Shingisho Goods Station	..	..	..	..	1 "
Taiden-Mokho	..	..	..	..	162 "
Riri-Kunzan	..	..	..	..	14 "
Ryuzan-Gensan	..	..	..	..	138 "
Gensan-Shinhokusei	..	..	..	..	149 "
Kisshu-Tansen	..	..	..	..	52 "
Kwanei-Kyokudo	..	..	..	..	170 "
Seishin-Yujo	..	..	..	..	5 "

Total 1,341



Observation and Dining Cars, Chosen Government Railways

Mileage Worked and Traffic Returns

The average mileage operated for the year was 1,319 miles for passenger traffic and 1,320 miles for goods traffic, while the train mileage, passenger car mileage and goods wagon mileage were 6,142,976; 24,545,792 and 51,569,465 miles respectively. The number of passengers aggregated 18,457,477 against 630,881,754 of the number of passengers carried one mile, while the total weight of goods hauled was 5,027,096 tons against 682,680,787 ton-miles. The coaching receipts amounted to Y.16,414,789 and goods receipts to Y.12,396,057 making a total of Y.33,811,296. The total revenues for the year including Miscellaneous receipts, Suspense account and advances, amounted to Y.51,811,608 with expenditures of Y.40,967,574 leaving a balance of Y.11,114,034.

Expenditures

Itemization of Expenditures shows the following distribution:

Salaries	Y.1,897,939
General Expenses	785,822
Maintenance	5,609,022
Rolling Stock Improvement	3,274,247
Transport Expenses	6,625,297
Traffic Expenses	4,720,223
Hotels	840,282
Hospital and Medical	199,780
Special Grants	216,833
Reception Expenses	9,901
Additional Expenses	1,098,776
Relief Association Grants	198,101
Refunds, Advances and Loss made good	15,221,346

Total Y.40,697,574

As shown above, the balance between the revenue and working expenses was Y.11,114,034. The net profit, however, after deducting Y.4,534,036 of miscellaneous charges, came to Y.11,109,640.

The total expenditures for construction and improvements to 1924 was Y.192,366,218. Up to the end of 1928, a further Y.65,000,000 has been expended, while Y.50,000,0000 has been



General View of Ryusan Workshops

fixed for 1929, 1930-31. The total capital investment of the State Railways up to March, 1927, was Y.294,409,832.

(During the last year, 1928, the Government railways earned Y.52,000,000 gross receipts and expended Y.41,000,000. The freight carried amounted to 682,681,000 ton-miles and 18,457,000 passengers were carried.)

Purchase of Supplies

The purchase of railway supplies for the year under survey amounted to Y.13,488,409. It is interesting to note that only Y.591,573 was expended for foreign materials, the balance all being spent for home products, including eight new locomotives costing Y.637,200,

Rolling Stock

The number of locomotives at the end of the 1927 fiscal year, was 247, aggregating 23,026 tons in weight and consisted of 97 tank and 150 tender locomotives. The coaches numbered 621 with a seating capacity of 36,919 and the freight wagons 2,738, with a capacity of 65,668 tons.

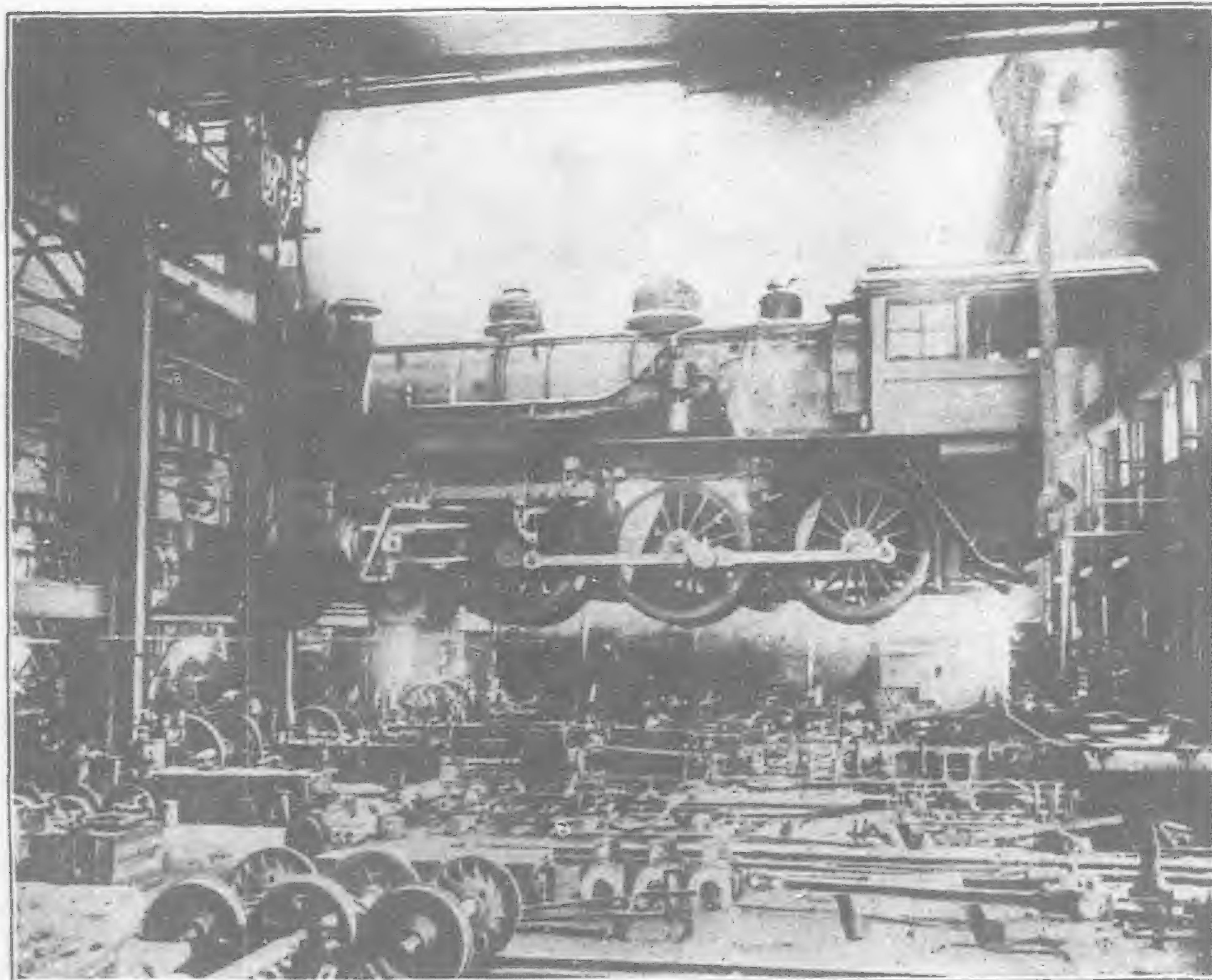
Workshops

Railway workshops are located at Keijo, Fusan and Heijo.

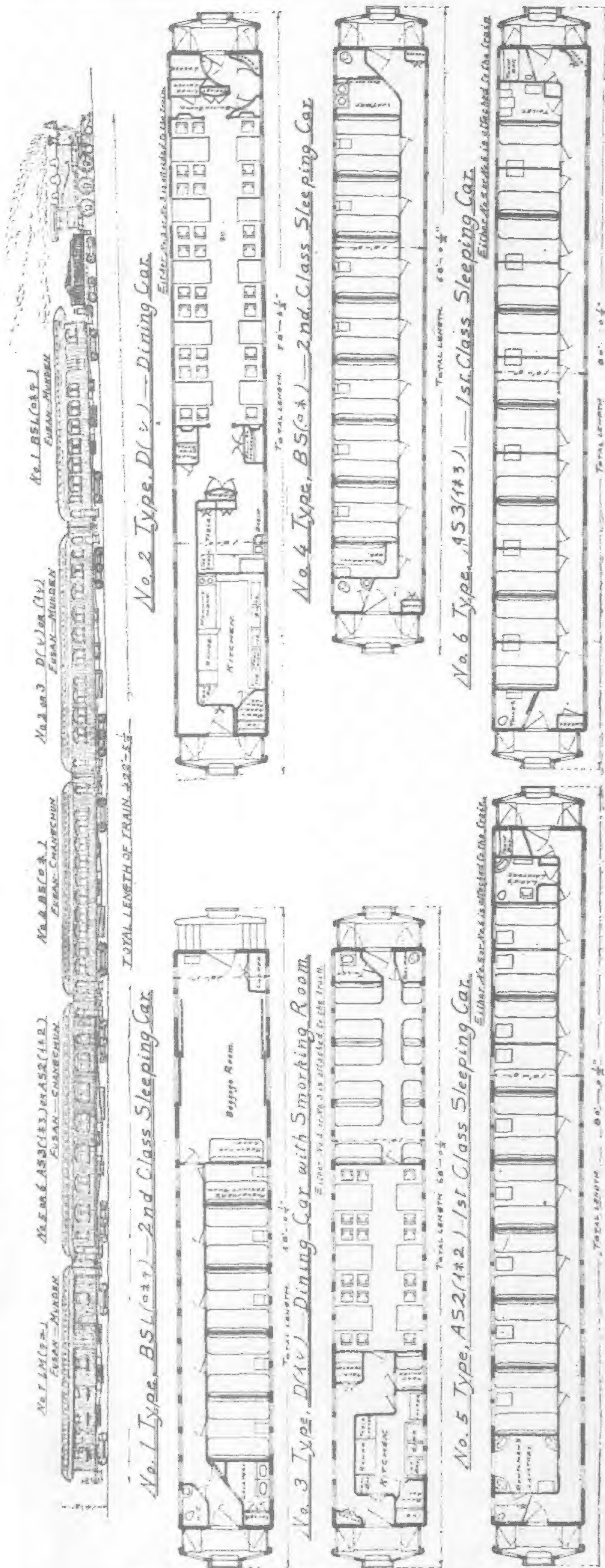
Among the principal items made at these shops for the Railways own use were 33 coaches, 25 wagons, 84 girders and 72 sets of switches, while 208 locomotives, 596 coaches, 2,090 wagons and other items were passed through for repairs. In addition, 2 locomotives, 5 coaches and other materials were turned out for private railways.

New Construction

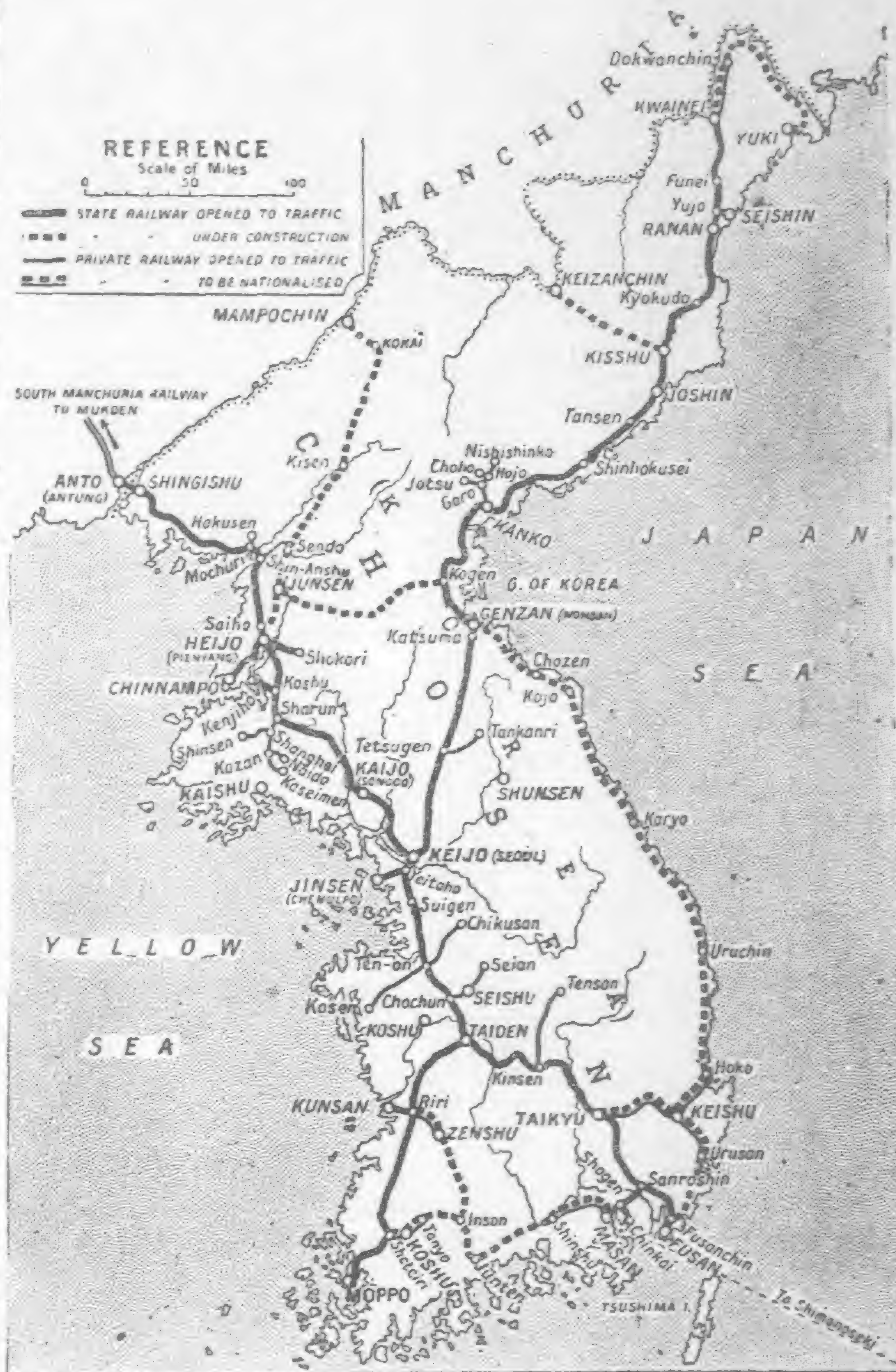
The attention of the Korean authorities is now being directed towards opening up the northern districts in the Yalu and Tumen valleys. This border region is exceptionally rich in forests, mines and water power and is practically undeveloped. The topography of the region is highly favorable for the development of extensive hydro-electric power and two large power plants are now under construction in this territory. The Chosen Hydro Electric Power Company is damming the Fusan River, a tributary of the Yalu, and diverting its flow to the Josen River flowing into the Sea of Japan. A head of 3,000 feet of water is being obtained to generate 150,000 kilowatts of power, to be used for the manufacture 300,000 tons of ammonium sulphate for artificial fertilizers. Another plant under construction, will develop 240,000 k.w. of power from the Josen River. The extension of the Korean railway system into these regions of economic potentiality is considered vital to the national



Ryusan Workshops, Erecting Shop



Plan of Chosen-Manchuria Express Train

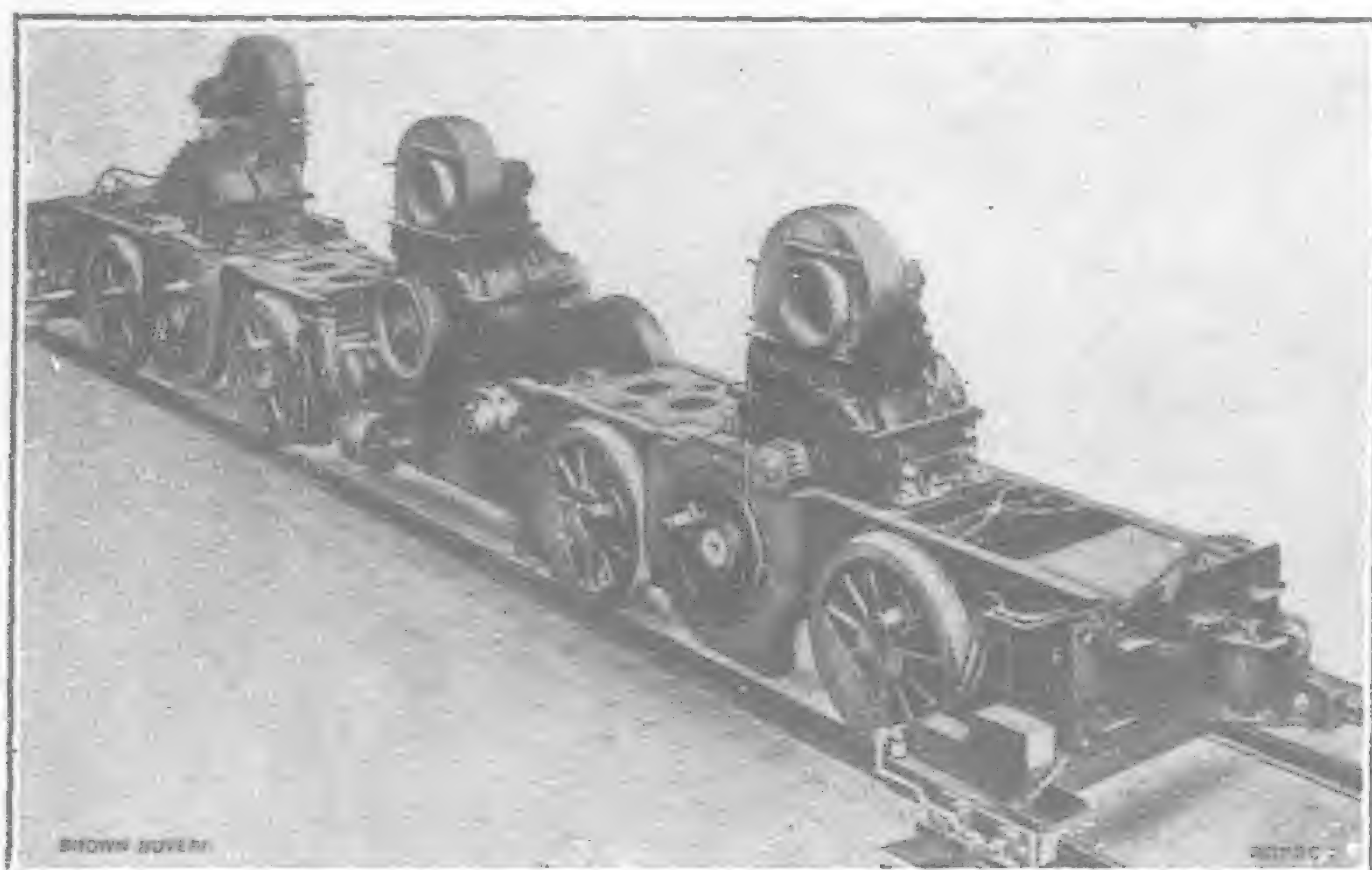


Map of the Chosen Government Railways Showing Lines in Operation and Projected

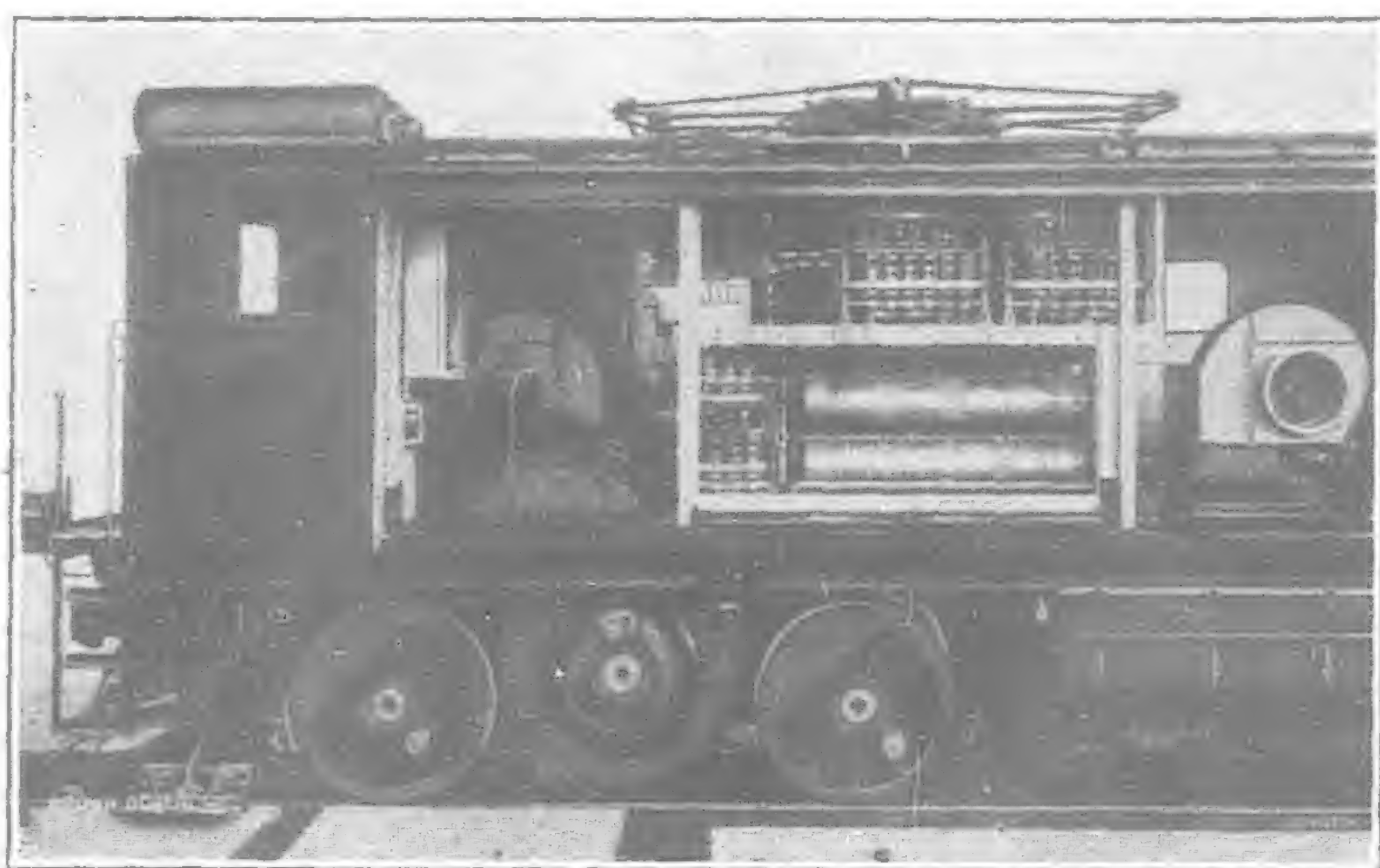
existence of Japan and the Government has accordingly decided to build several new lines into this region. The first of the lines will start from Yuki a harbor in the northeastern tip of Korea, and will follow along the south bank of the Tumen River and, after passing through Keiken and Onju provinces will reach Kwanei in Chientao. The second will branch off the Kankyo Main Line at a point near the port of Joshin, crossing the plateau to the upper Yalu River district at Keizanchin, opposite the Chinese town of Chohakufu. This line will serve a rich timber district. The third line will branch off from the Heijo-Gensan line at Junsen and will run almost north to Mampochoin on the south bank of the Yalu opposite the ancient Chinese town of Shuan. These new railways besides accelerating the development of the border lands, have a fair prospect of being connected with several new railways planned for Eastern Manchuria. When all these lines are completed, they will form a solid chain of inter-communication between Mongolia, Manchuria and Korea, and the products of these Chinese regions will find export outlets through the ports of Yuki, Seishin, Ranan, Joshin in North Kankyo and through Gensan in South Kankyo Province.

All of these ports are on the northeastern coast of Korea and the movement of goods in this direction will stimulate new steamship connections with Japan and the coast ports of China. Some 800 miles of new railways are needed along the Korean borders to encourage settlement and to protect the communities against bandit raids from Manchuria. In addition to these frontier lines, the East Coast Railway of 390 miles connecting Gensan with Fusan and branch lines connecting the latter port with Kunsan and Moppe

(Continued on page 32).



Usui-Toge Locomotive Type B-B; No. 10040. Underframe with Motors Built-in



Usui-Toge Locomotive Type B-B, No. 10040. Side Panels and Protective Grating for the Apparatus Framework Removed

Brown, Boveri Locomotives on the Japanese Government Railways

ELECTRIC tramways and suburban railways have been in use in Japan for the last thirty years. The first electric tramway was the one in Kyoto, opened in 1895. At the present time there are over 3,000 km of tramways and suburban, interurban, and mountain railways on which electric traction is used.

The electric locomotives at present owned by the J.G.R. are described in the table. With the exception of the old machines used on the Usui-Toge Line, all have been ordered and supplied within recent years.

Up to the present time, Brown, Boveri & Co. have supplied three entirely different types of locomotive to the J.G.R. These are:—
Two B-B combined rack and adhesion locomotives Nos. 10040 and 10041, for Usui-Toge.

Two B₀—B₀ goods locomotives Nos. 1020 and 1021 for the Tokaido Line. These had to be suitable for use first on the Yamate Lines and then on the Yokohama-Tokyo section.

Two 1 D₀ 1 express locomotives Nos. 7000 and 7001 for the Tokaido Line.

Particulars of these locomotives are contained in the table. It should be mentioned that the mechanical parts of the express locomotives and those for Usui-Toge were built by the Swiss Locomotive and Machine Works, Winterthur, while the mechanical parts of the B₀—B₀ goods locomotives were built by the Schweizerische Wagonsfabrik Schlieren.

IV. B₀—B₀ COMBINED RACK AND ADHESION LOCOMOTIVES FOR USUI-TOGE.

The weight of one of the old Usui-Toge locomotives type D, series 10020—33, used on the J.G.R. is 61 tons. The locomotive can haul a trailing load of 77 tons, or a total

train weight of 138 tons up a gradient of 6.7 per cent. With a resistance of 10 kg/ton this gives a total tractive effort of the locomotive at the wheel tread of

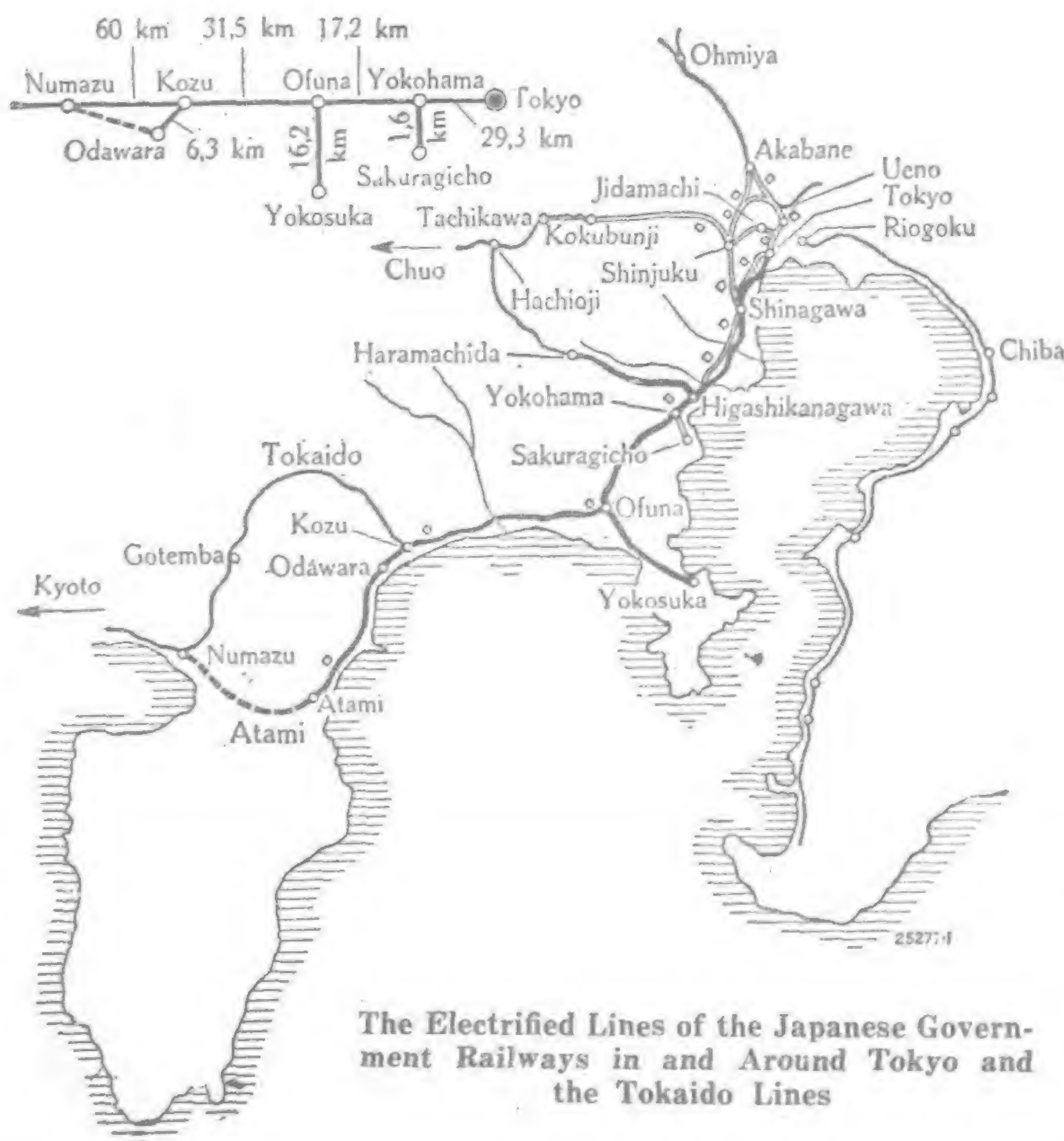
$$138 (10 + 67) = 10,600 \text{ kg.}$$

Half of this force is developed by the adhesion wheels and the other half by the driving pinions. The co-efficient of friction is $\frac{5.3}{61} = 1:11.5$ and the load on each pinion tooth 2650 kg or $\frac{2650}{3 \times 25} = 35.5$ kg per millimetre of tooth width.

This load is not, in itself, too great.

With these old locomotives, however, sufficient use is not made of the adhesive weight, while it has been found that the driving pinions wear very rapidly (as much as 20 mm off the tooth face in seven months). It has also been necessary to replace the racks very frequently. This was due to the use, in the first place, of unsuitable material, and also to the stresses in the metal exceeding the allowable limits, due to the fairly violent rocking experienced with these locomotives. The locomotives are equipped with two motors each having a one-hour rating of 315 h.p. One motor drives the four adhesion driving axles through reduction gearing, jack shaft and connecting rods, and the other motor drives the driving pinions in a similar manner.

It was obvious that when designing a new locomotive better use should be made of the adhesive weight and, if possible, the driving pinions should be relieved of some of their load. It was also desirable to dispense with coupling rods for driving the pinions, as considerable play is liable to develop at the bearings of these and inaccuracies can be made in constructing them.

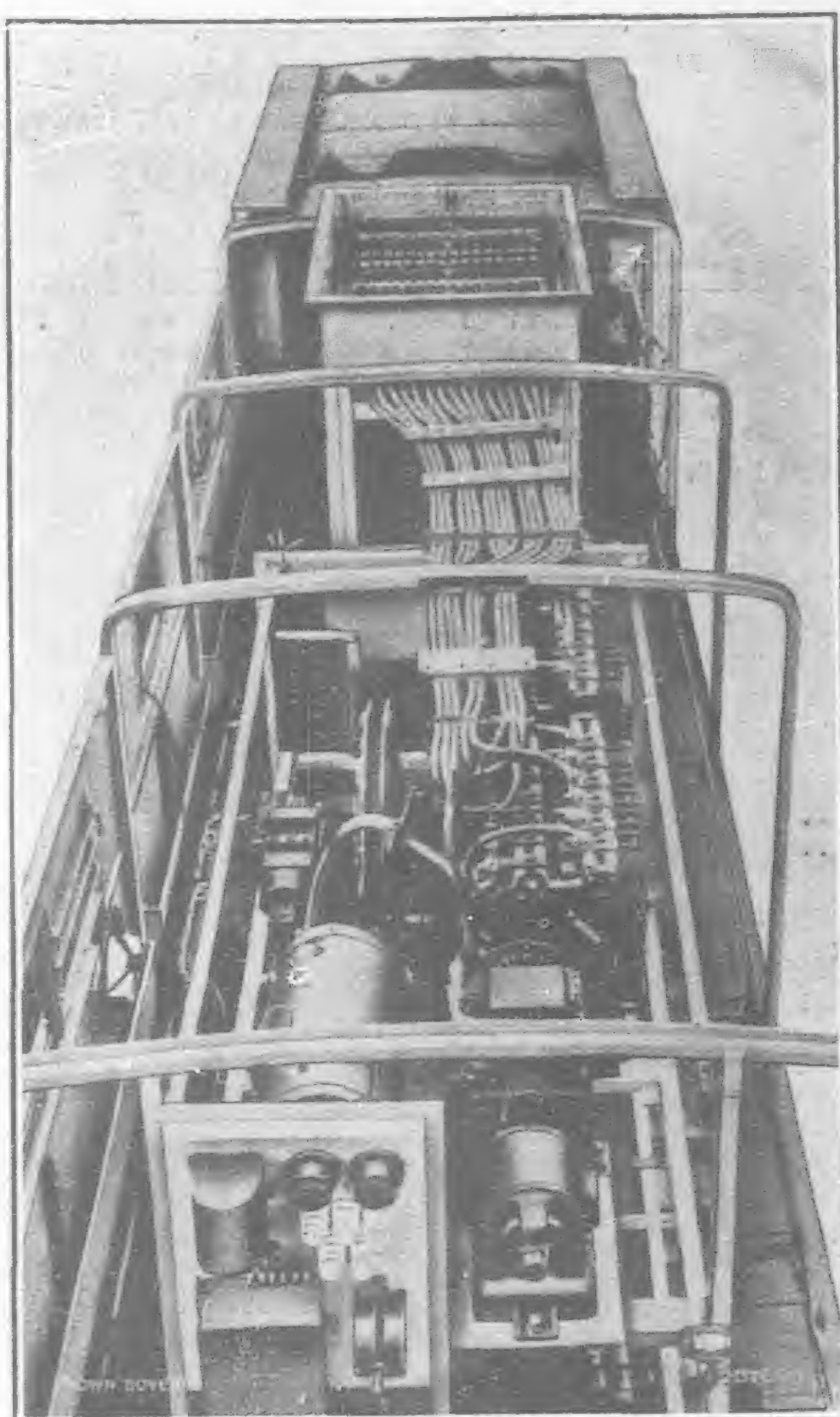


The Electrified Lines of the Japanese Government Railways in and Around Tokyo and the Tokaido Lines

It is also found better to mount the adhesion driving axles in two bogies in order to obtain smaller wheelbases with correspondingly improved facilities for taking curves.

With an adhesion co-efficient of 1:6.5, which should be sufficient to ensure that the wheels will not skid, a locomotive weighing 60 tons can develop a tractive effort of 9,300 kg by adhesion alone. This corresponds to hauling, on a 6.7 per cent. gradient, and with a total tractive resistance of 10 kg/t, a train of $\frac{9300}{67+10}=120$ tons. The 60-ton

locomotive can thus haul, on this gradient, a weight equal to itself. The upkeep expenses of the Usui-Toge Line have always been heavy due to the rapid wearing away of the rack and driving pinions. As a consequence, the J.G.R. considered the question of dispensing altogether with the rack and operating the section as a pure adhesion line. In view, however, of the low efficiency when hauling trains in which the trailing load only equals the weight of the locomotive, and of the greater safety obtained when trains descending the gradients can make use of the rack for braking purposes, it was preferred to continue using mixed service. If it is assumed that an additional force equal to half the adhesive tractive effort of a 60-ton locomotive can be taken from the rack, a locomotive of this type can thus develop $9300+4650=13,950$ kg at the



Usui-Toge Locomotives No. 10040. View of the Apparatus Framework and the Resistance Box

wheels tread. This corresponds to an output of 770 h.p. at a speed of 15 km/h. At the same time the load on the rack is 12 per cent. less than when the old locomotives were used and the locomotives can haul trains of $\frac{13,950}{67+10}=180$ tons=120+60 tons up 6.7 per cent. gradients, i.e., trains of double their own weight or 56 per cent. greater trailing loads than the locomotives of the 10020—33 series. The axle loads in both cases are the same, but the new locomotives the pressures on the teeth are more favorable and the running conditions better.

These new locomotives are equipped with three motors: two drive the adhesion wheels, which are contained in two bogies, and the third drives the two driving pinions. This scheme suggested by Brown, Boveri & Co. was accepted by the J.G.R., and at the end of 1924 the former received the order to build, provisionally, two locomotives of this type. A total one-hour tractive effort of 12,000 kg at the wheel tread with a total train load of 160 t was stipulated, 8,000 kg to be developed at the rails and 4,000 kg at the rack by three motors each for a one-hour rating of 200 kw at the motor shaft. The speed up a gradient of 6.7 per cent. was to be 15.5 km/h. The locomotives were provided with electric braking equipment capable of braking half the weight when traveling at about 16 km/h on the steepest part of the rack section,

DIRECT-CURRENT LOCOMOTIVES OF THE JAPANESE GOVERNMENT RAILWAYS.—GAUGE 1067 mm.

Number of locomotives	Type and series number	Nature of service	Max. speed km/h	One-hour rating at tread of wheel H.P.	Approx. weight of loco. in working order tons	Year of delivery	Builders
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ADHESION LOCOMOTIVES FOR 1500-V CONTACT-LINE PRESSURE.

2	B ₀ —B ₀ 1000—01	Goods traffic	65	4 × 275 = 1100	56.5	1922	Westinghouse—Baldwin
2	B ₀ —B ₀ 1010—11	"	65	4 × 280 = 1120	60	1923	General Electric Co.
2	B ₀ —B ₀ 1020—21	"	65	4 × 325 = 1300	60	1923	Brown Boveri
17	B ₀ —B ₀ 1040—56	"	75	4 × 285 = 1140	58.5	1923	Engl. Electric Co. North British Loco. Co.
9	B ₀ —B ₀ 6000—08	Local & slow passenger trains	85	4 × 300 = 1200	58	1923-1925	"
2	B ₀ —B ₀ 1030—31	Goods traffic	65	4 × 285 = 1140	60	1924	"
8	2 C ₀ —C ₀ 2 8000—07	Express trains	95	6 × 285 = 1710	97	1924	"
1	B ₀ —B ₀	Goods traffic	65	4 × 300 = 1200	59	1924	Metropolitan-Vickers Winterthur
3	B ₀ —B ₀ 1070—72	"	70	4 × 335 = 1340	59	—	Hidachi Eng. Works
2	1 D ₀ 1 7000—01	Express trains	100	4 × 555 = 2220	77.5	1926	Brown Boveri
4	B ₀ —B ₀ 1060—1063	Goods traffic	65	4 × 300 = 1200	60	1926	General Electric Co.
6	1 B ₀ —B ₀ 1 6010—6015	Slow & express passenger trains	100	4 × 333 = 1332	68	1926	Westinghouse—Baldwin
2	1 C ₀ —C ₀ 1 8010—8011	Express trains	110	6 × 333 = 1998	84.7	1926	"

COMBINED RACK AND ADHESION LOCOMOTIVES FOR 600-V CONTACT-LINE PRESSURE.

12	C 10000—11	Slow & express passenger trains	20	2 × 315 = 630	46	1911	A. E. G. Maschinen-Fabrik Esslingen
14	D 10020—33	"	20	2 × 315 = 630	61	1919	Japanese Government Railways, Omya Works
2	B—B 10040—41	"	25	2 × 255 = 765	59.5	1926	Brown Boveri

88 Total number of electric locomotives of the J. G. R. at the end of 1926.

PARTICULARS OF THE THREE LOCOMOTIVES SUPPLIED BY BROWN, BOVERI & CO. TO THE JAPANESE GOVERNMENT RAILWAYS
FOR DIRECT CURRENT AND A GAUGE OF 1067 mm.

	Combined rack and adhesion locomotive type B—B for Usui-Toge			B ₀ —B ₀ goods locomotive			1 D ₀ 1 express locomotive		
	Adhesion	Rack.	Max.	Continuous	1 hr.	Max.	Continuous	1 hr.	Max.
Maximum gradient	25	6			10			10	
Total train weight		160			660			550	
Traction effort at tread of wheels	5.0	12.0	15	7.6	9.8	15	7.1	9.0	15
Speed	18	15.5	25	39	36	65	72	66	100
Output at tread of wheels	330	690	—	1040	1300	—	1880	2200	—
Output at motor shaft	350	770	—	1100	1380	—	2000	2340	—
Contact-line pressure		600			1500			1500	
System of current collection	Third rail and pantograph			Pantograph			Pantograph		
No. of bogies		2			2			2	
Length over buffers		13,000			13,250			13,600	
Total wheelbase of driving wheels		9000			9200			5300	
Fixed wheelbase		2500			3150			1900	
Diameter of driving wheels		1067			1400			1600	
Diameter of pony wheels		—			—			939	
Rack	Abt triple bar rack			—			—		
No. of rack pinions		2			—			—	
Pitch circle diameter of rack pinions		802			—			—	
Distance between centres of rack pinions		2180			—			—	
Gear ratios	4.95 : 1 Ad. : 3.7 : 1 pinions			3.9 : 1			3.34 : 1		
Max. load on driving axles		15			15			15	
No. of motors and one-hour output at motor shaft		3 × 270			4 × 345			4 × 585	
Speed		380			530			750	
Terminal pressure		600			1500/2			1500/2	
Cooling	Forced 1.4 m ³ /sec at 60 mm of water A.I.E.E.			Forced 0.7 m ³ /sec at 50 mm of water A.I.E.E.			Forced 1.25 m ³ /sec at 75 mm of water A.I.E.E.		
Standards	By electric motor			Multiple-unit by electric motor			Multiple-unit by electric motor		
Control	—			—			—		
No. of steps: Series		9			8			11	
Parallel		5			4			6	
Field weakening		2			1			1	
Braking		9			—			—	
Electrical brake	Rheostatic			—			—		
Mechanical brakes	Combined compressed-air and vacuum brake. Handbrake			Compressed air brake Handbrake			Combined compressed-air and vacuum brake. Handbrake.		
Weights: Mechanical part		40.0			33			48	
Electrical part		19.5			27			29.5	
Total		59.5			60			77.5	
Adhesive weight		59.5			60			59.0	

and the whole train weight on a maximum gradient of 2.5 per cent. on the adhesion section at a speed of 25 km/h.

(1) *Mechanical part.*—As already mentioned, each locomotive has two adhesion driving bogies between which the framework containing the driving pinion is arranged (German Patent No. 394856). The axle boxes of the leading driving axles are of the usual type; those of the inner axles are made as double axle boxes of cast steel and are provided with bearing plates on which the driving pinion bogie rests. Both side members of each bogie are composed of 22-mm sheet-steel plates held together by the buffer bars, the motor supports, and the cross frames. The underframe of the locomotive body rests on each bogie in four points: on a roller bearing at the front, on the bogie pivot, and on two side supports. The roller bearing consists of a roller borne by a transverse equalizer suspended from the frame plates by helical springs. The bogie pivot is a pin with semi-spherical ends resting in bearing sockets. In one bogie the bearing is a close fit and in the other a movement of 2 × 20 mm is allowed for in order to prevent any risk of binding when negotiating curves. The two side supports of the underframe are in line with the bogie pivot. They are provided with adjustable compression springs.

The framework supporting the driving pinion rests on the two innermost adhesion driving axles,

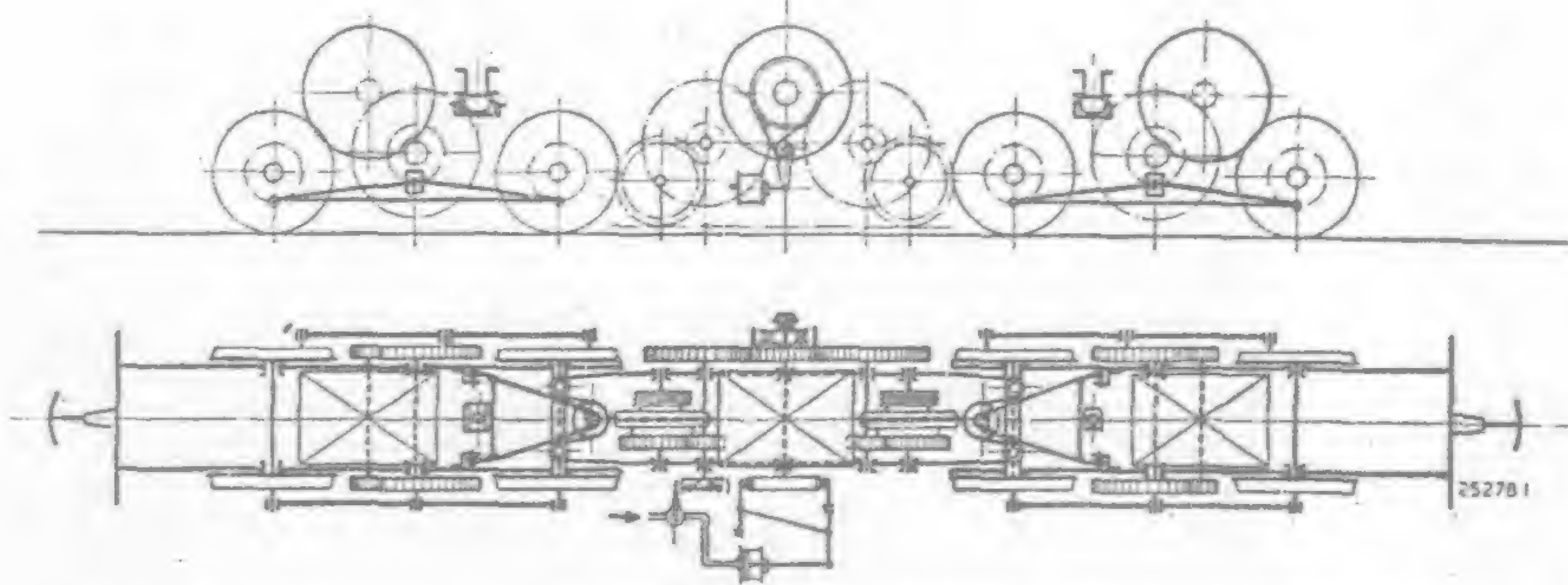
which are thus heavily loaded. By adjusting the roller bearings at the ends of the locomotive the load can be evenly distributed among the four driving axles.

The power from the motors to each of the two adhesion driving axles is transmitted on either side through a single-reduction gear to a jack shaft mounted 170 mm above the centre of the driving axle. The jack shafts and axles are connected, by simple coupling rods, with the blocks which move vertically according to the displacement of the springs. The gear wheels are of low-carbon steel while the pinions are made of chrome-nickel steel.

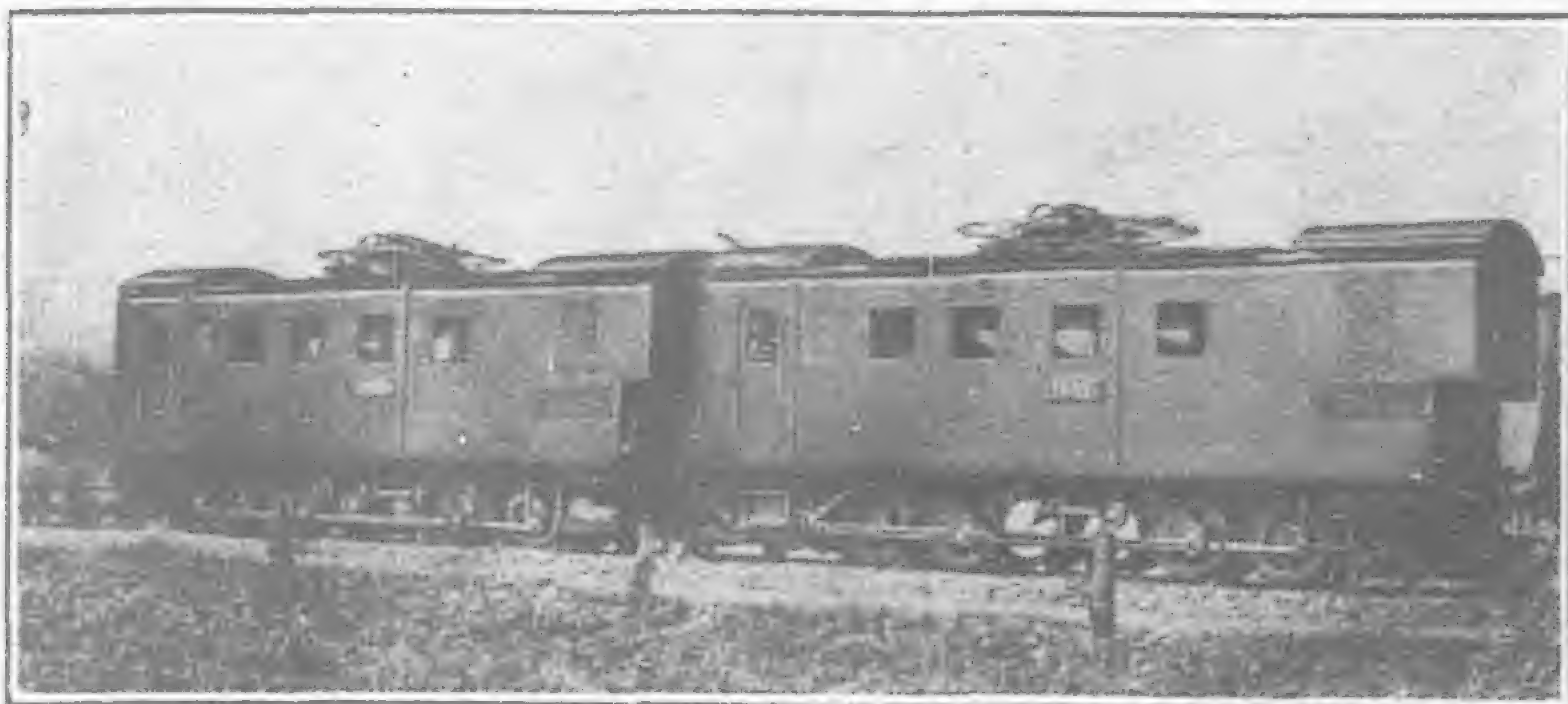
The drawing and buffing gear on these locomotives is of the usual type of central automatic coupling used on the J. G. R. The couplings between each bogie and the driving pinion frame are triangular-shaped cast-steel members fastened to the bogie frames at two points. On the driving-pinion frame each fork is secured to a pin which also serves as the pivot about which the frame can move.

A safety bolt fixed to the double axle box of one of the adhesion driving axles and holding down the fork lever prevents the driving pinions mounting the teeth of the rack. The vertical play between the fork and the head of the safety bolt can be adjusted by means of packings.

The driving pinion bogie is built up of two frames of 20-mm steel plates stiffened at the centre by a steel casting



Usui-Toge Locomotive Type B—B No. 10040. Diagrammatic Arrangement of the Running and Driving Gear



Two Combined Rack and Adhesion Locomotives Type D of the 10020—10033 Series, Built by the Japanese Government Railways

which carries the driving motor, and at each end by two cast-steel supports. The bearings for the driving pinions and the intermediate shafts are mounted in these end supports which form, together with the four arms, the supports on the double axle boxes of the inner adhesion driving axles. The points of support are provided with adjustable compression springs. The extent to which the teeth of the pinions grip into the rack can thus be adjusted according to the wear of the tyres on the adhesion wheels.

The driving pinions are made of nickel-chrome steel. Each has three tooth rims containing 21 teeth at a circumferential pitch of 120 mm. The rims are driven through springs and are displaced relative to each other by one third the pitch.

A speed regulator is provided on the shaft of the reduction gear at the lower end of the locomotive and applies the band-brake mounted on the end of one of the motor shafts if the speed of the vehicle on the rack sections exceeds 18—22 km/h.

On one end of the motor shaft driving the pinion there is a brake drum and on the other end a clutch. This is an adjustable plate clutch with Chekko lining.

Only one driver's cab is provided in the locomotive, at the end facing the valley; it is somewhat wider than the rest of the body, enabling narrow windows to be put in the wall at the back to give a view up the track. Thus together with the other windows at the side and front the driver has an unrestricted view in every direction.

The locomotive has been equipped with four mechanical brakes in addition to the electrical brake:—

(a) *A Westinghouse type 14EL compressed-air brake acting on the adhesion wheels.*—A separate cylinder is provided for each adhesion bogie and a brake block, mounted outside the bogie frame, acts on each wheel.

(b) *An adhesion hand-brake* which works only on the adhesion wheels at the end of the locomotive facing the valley.

(c) *A hand-operated band-brake* operating on each of the two driving pinions.

(d) *A compressed-air operated band-brake on the motor shaft*, also capable of being automatically applied by the speed regulator.

Vacuum brakes and vacuum brake valves are also provided. The compressed-air brake operates on the locomotive and train, but the vacuum brake only on the train. Later on, when the J.G.R. change over completely from the vacuum to the compressed-air braking system, the vacuum brakes will be converted.

(2) *Electrical equipment.*—There are not many new features about the electrical equipment, which is designed for 600-V direct current. The connections of the traction motors are, however, interesting. On the adhesion sections only the two adhesion motors are run. They are connected in series-parallel when starting, bridge connections being used. When running with maximum field-weakening, the motors being provided with two field taps, a speed of 22 km/h can be attained on a 2.5 per cent. gradient with a total train load of 160 tons.

When running on to or off the rack sections the fields of all three motors are connected in parallel and the three armatures in series.

All three motors run at the same speed independently of the load, if the fields and armature voltages are the same. Thus just before running on to the rack section, the rack motor, which is running empty, will be in synchronism with the loaded adhesion motors. By suitably choosing the reduction gear and the wheel diameters, the peripheral speeds of the driving pinions and adhesion wheels will be equal, giving a shock-free engagement with the rack, independently of the load and gradient. The only point to be watched, however, is that the motor driving the pinion is started up in sufficient time to enable it to attain the correct speed before running on to the rack section.

The same connections are used when the locomotive runs off the rack section to prevent the series-wound driving-pinion motor running away on being relieved of its load. Any danger when running off the rack section due to forgetting to change the connections is thus avoided, as the speed regulator prevents the motor running away. When running on to the rack section the speed is from 5 to 8 km/h; on leaving the section the speed need not be diminished below that permissible on the rack.

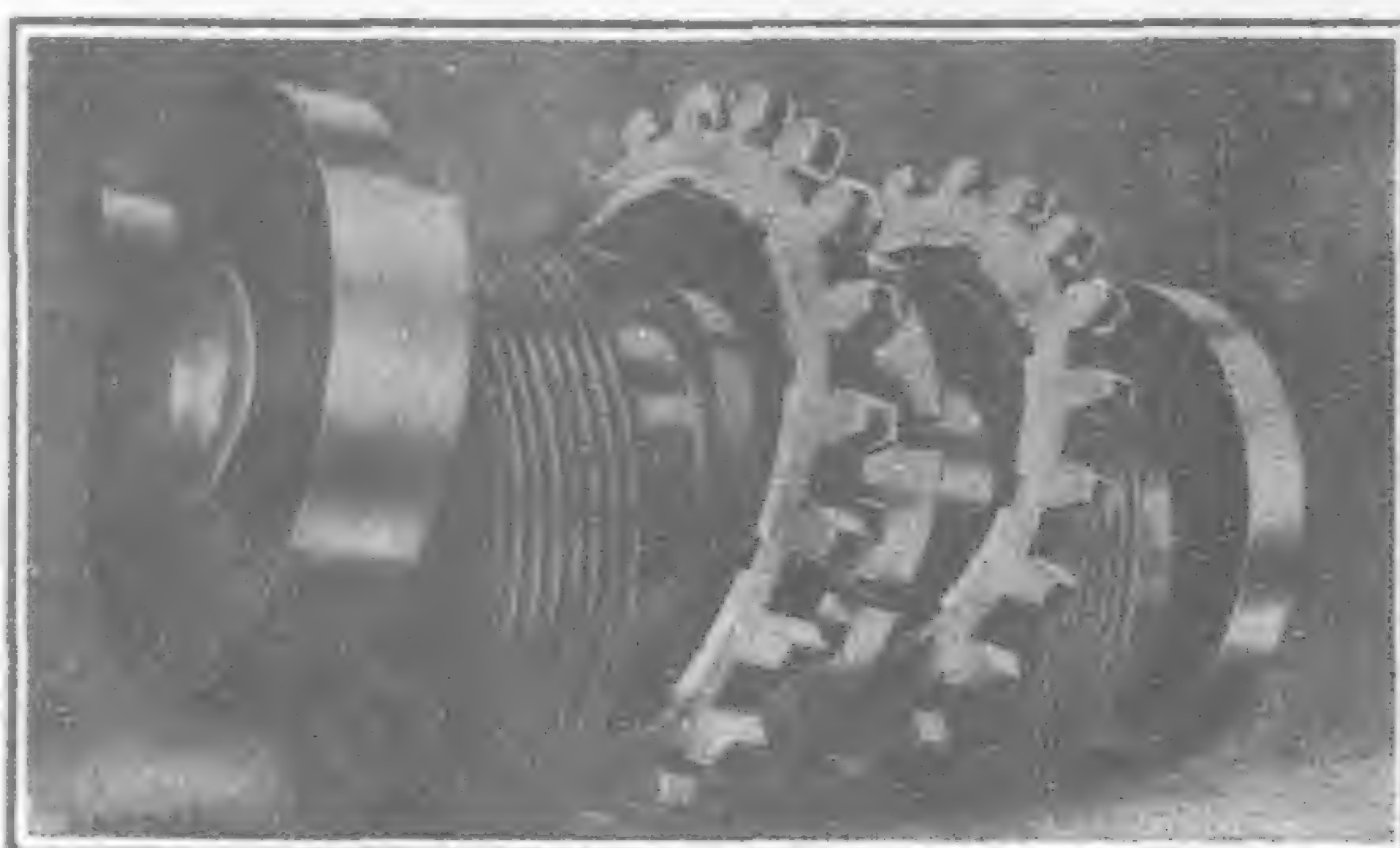
When the locomotive has entered the rack section or is being started on it, the connections are made as follows: First the two adhesion motors are connected together in parallel, and in series with the rack motor. The latter thus receives double the current supplied to each of the adhesion motors. It is almost impossible

for the adhesion wheels to skid, as the greater part of the load is transferred to the rack motor. The starting resistance is first cut out in nine steps. Then all three motors are connected up in parallel, the starting resistance being again put in circuit simultaneously. This is finally cut out again in five steps.

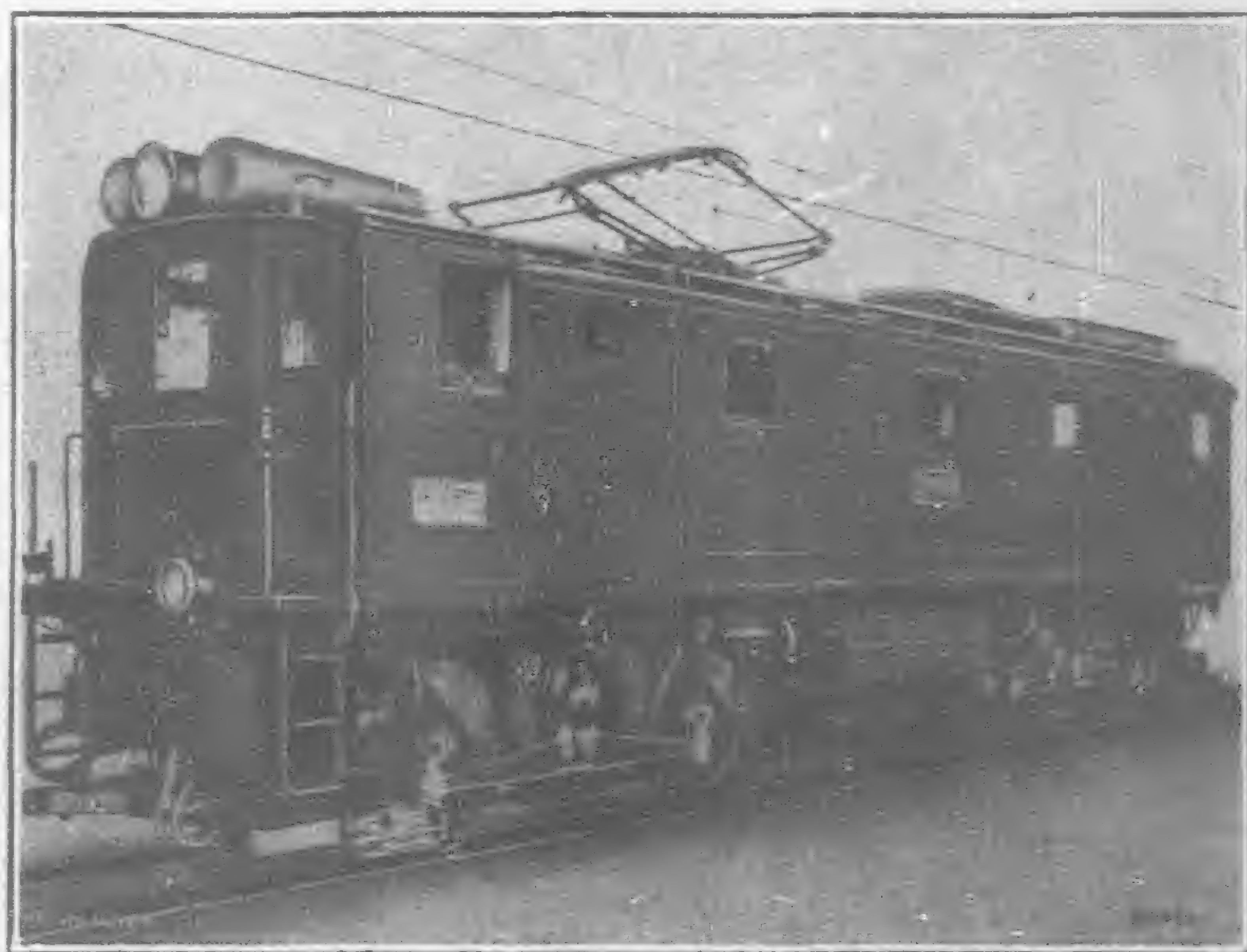
Bridge connections are again used when going over from series to parallel. Rheostatic braking can be employed on both adhesion and rack sections. When travelling on a rack section the two adhesion motors are then again connected in parallel, with their field connections crossed, and in series with the rack motor.

These five connections are obtained by means of the combination switch. This works without current; it is pneumatically actuated and electro-pneumatically controlled. To be able to alter the connections when running off the adhesion on to the rack section without having to bring the controller to the zero position, six contactor switches are built on to the combination switch. It is thus possible to move the lever directly into the change-over position from position 4, i.e., under the load corresponding to this steps.

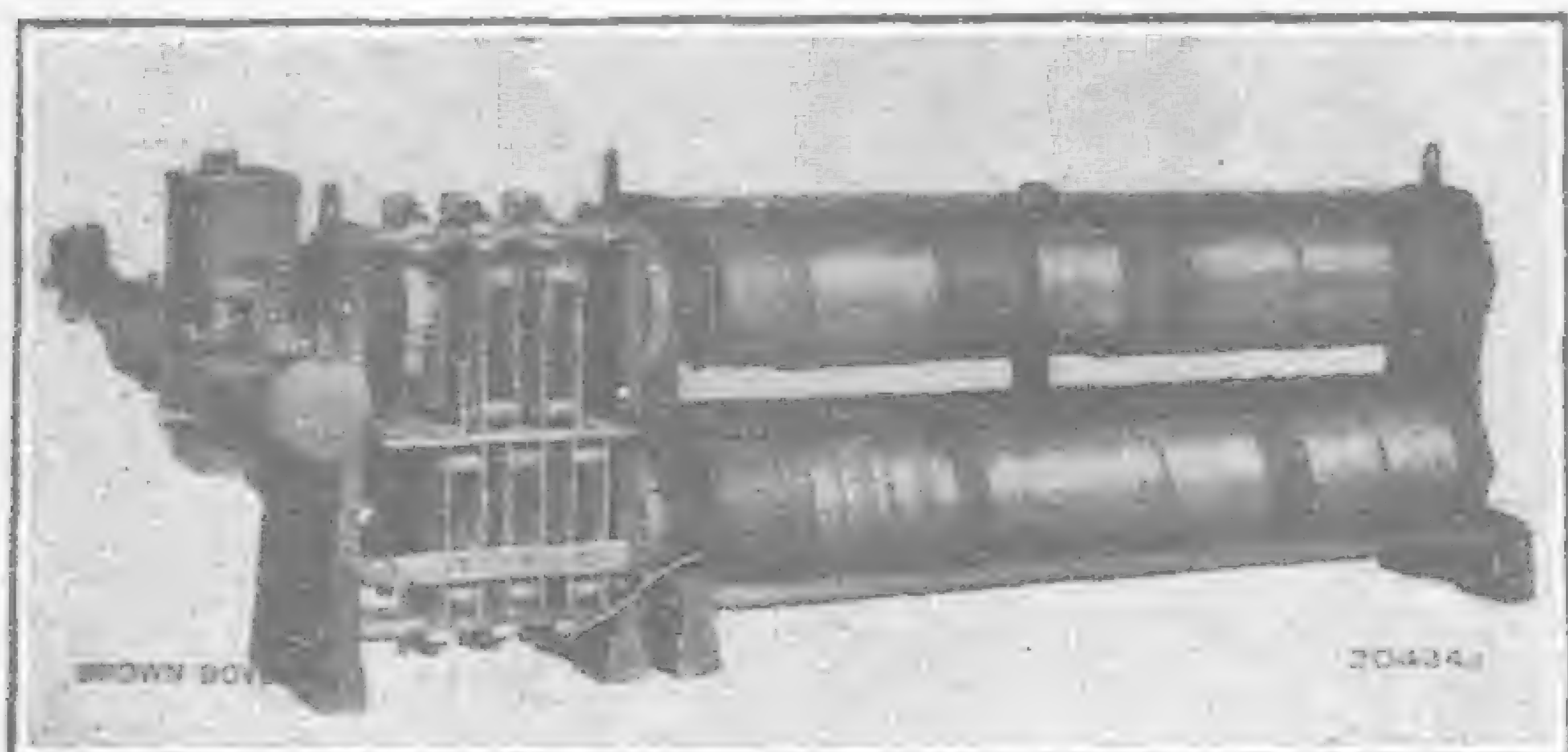
The open section on the Usui-Toge Line is provided with a third rail for current collection. Over single tracks in the terminal



Worn Tooth Rims of One of the Locomotives Type D, No. 10020—10033



Usui-Toge Locomotive Type B—B, No. 10040



Usui-Toge Locomotive Type B—B, No. 10040.
Grouping Switch Controlled by Compressed-
air Motor

are pneumatically operated.

The main switch is a Brown Boveri single-pole high-tension switch with horn break and over-current and no-volt relays; it can be operated either by hand or compressed air.

The traction motors are six-pole series-wound motors with interpoles. The field coils are insulated with asbestos and the armature windings with mica silk. Each motor is separately excited by a built-on blower set which delivers 1.34 m³ of air per sec. at 50 mm of water. Adhesion and driving pinion motors are exactly alike and can be interchanged without any adjustments or alterations being necessary.

On account of its low weight, strip resistance is very suitable for the starting and braking resistances in a rack locomotive, which has to climb many gradients during the course of a day's work. In the case under consideration a cast-iron resistance would be about twice as heavy. In these locomotives the resistances are made of corrugated constantan strip cooled with forced draught from a separately mounted motor-driven blower, which has a capacity of 6 m³/sec at a pressure of 50 mm of water. Braking the whole train weight of 160 tons on a 7.6 per cent. gradient cor-

responds, however, a contact wire has been erected. The locomotives have therefore been fitted with collector shoes for the third rail and pantographs for the contact wire. The pantographs

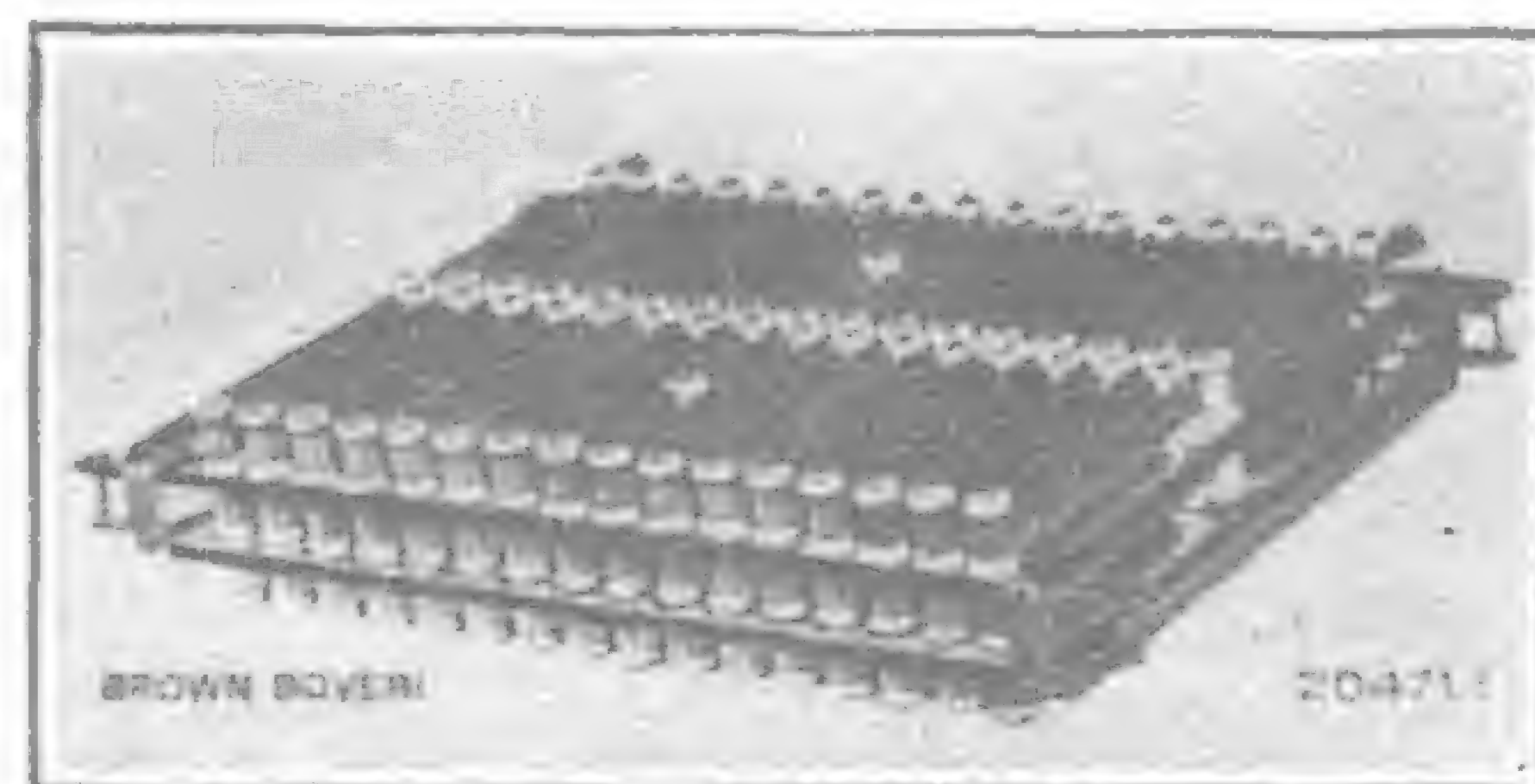
ponds to a load of 360 kw on the braking resistances. This can be withstood for half an hour, the temperature rise being about 300° C. Under normal conditions, however, only half the weight of the train will be electrically braked by the locomotive, the other half, distributed along the whole length of the train, being mechanically braked. This increases the safety of the train compared with that of one in which the whole weight when travelling downhill is borne by the locomotive.

The rheostatic brake enables the locomotive to be braked electrically without using current from the contact line. The resistances and motors must, however, be artificially cooled. The connections for the auxiliary motors are therefore changed over by a hand switch, so that these are supplied with the braking current.

For the auxiliary control and lighting circuits a pressure of 100 V was stipulated. This is stepped down from the contact-line voltage in a small 2-kw motor generator type GSUA with auxiliary exciter to keep the speed constant with varying primary voltage and load. The converter works in combination with a Tudor accumulator battery consisting of 50 elements each of which has a capacity of 40 ampere-hours when discharged in ten hours. The maximum charging current is 10A. The various switching operations concerned with the connecting in parallel and loading of the battery are performed by a charging apparatus.

All the electrical equipment has insulation suitable for tropical conditions.

The locomotives are not equipped for multiple unit control. They are always coupled to the lower end of the train when traveling either up or down gradients.



Usui-Toge Locomotive Type B—
B, No. 10040. Element of the
Starting and Braking Resistance

Chosen Government Railways

(Continued from page 27).

will also be built. Kunsan is the foremost port for the export of rice and Moppo for the cotton trade. The East Coast Railway will help to develop the detached districts of Kogendo and thus form an unbroken chain of traffic along the entire eastern Korean coast from Fusan to Kwaneui and thence by the Chinese railways to Kirin and Manchuria. Work is also proceeding on the Heijo-Gensan Line, 132 miles.

It is easy to see that the new construction plans of the Korean Government will revitalize the country. The railway extensions now in hand will bring isolated villages now suffering from miserable economic conditions, to the level of provincial towns and cities. The rapid increase of industries in Korea and the growing volume of trade augurs a bright future for these lines.

The final selection of a port on the northeastern coast of Korea as an outlet for the new Manchurian railways, is still undetermined, awaiting the outcome of negotiations now taking place between the South Manchurian Railway authorities and the Chinese Government. Seishin, Yuki and Rashin have been named as the terminal of this system. The final decision will probably rest with the Korean Government and the Japanese War Office. This problem is so directly connected with the Manchurian railway disputes that its solution rests largely on the outcome of the present negotiations for the extension of the Kirin-Tunhua to the Korean border.

Private Railways in Korea

This subject was treated in detail in the November, 1924 number of THE FAR EASTERN REVIEW. Briefly summarized, the Government-General of Korea promulgated in 1912, regulations for the construction of private railways and two years later, granted subsidies to important lines to meet any deficiency in profit below a certain percentage on the paid-up capital of the companies concerned. Up to 1917, this rate was 6 per cent. It was raised to 7 per cent. in 1918 and to 8 per cent. in 1919. In March, 1921, a new law relating to private railway subsidies was promulgated with a view to fixing a standard rate which now stands at Y. 4,500,000.

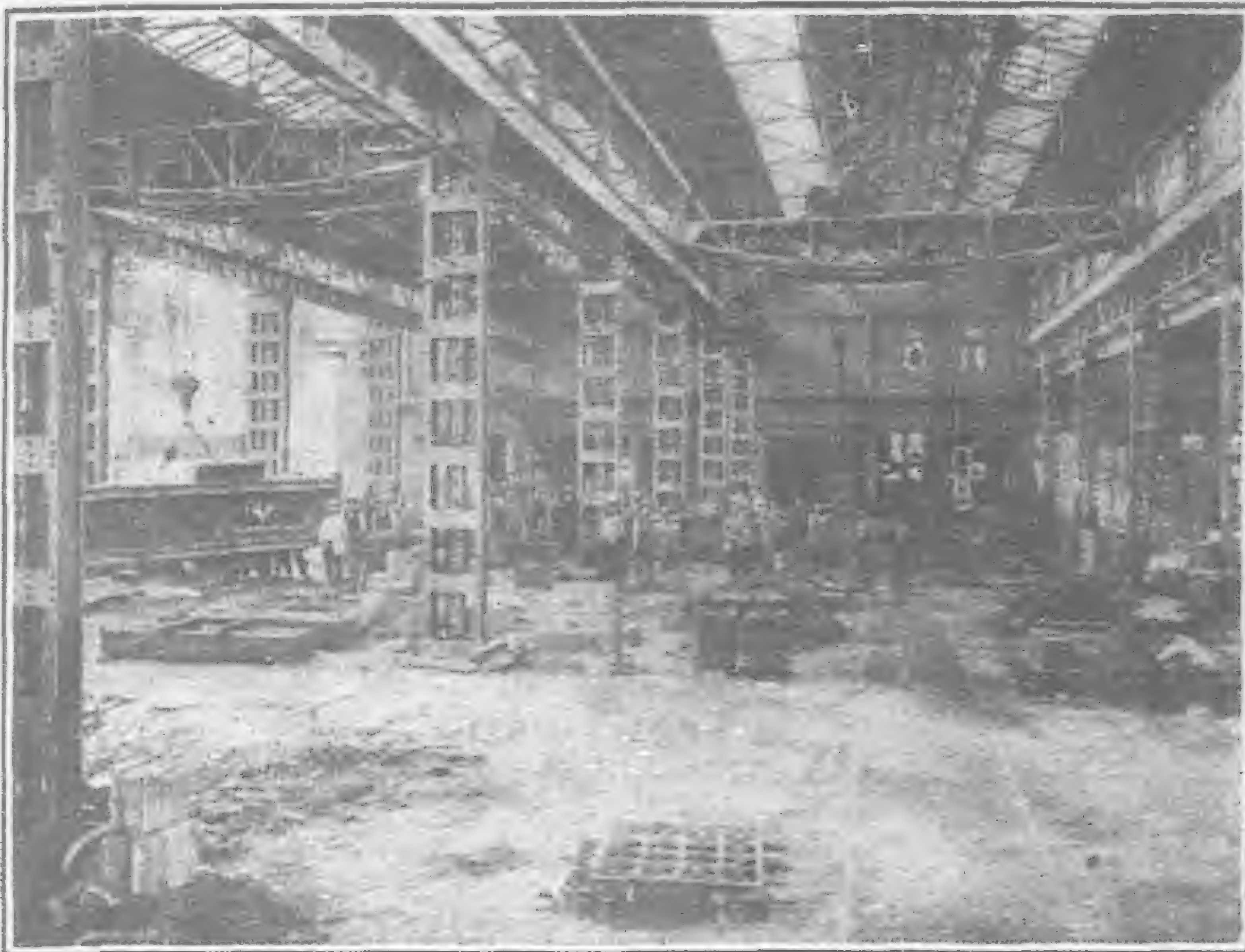
Private railways are limited to standard gauge lines with steam or electricity as motive power. According to the most recent report, (December, 1928), the total length of private railways in Korea is 543 miles with charters granting rights to construct 731 additional miles. The business results of these lines are improving and some companies are showing fair profits. Many of these lines are considering changing from steam to electricity. The Kongosan Electric Railway carried 315,825 passengers in 1927 and 53,111 tons of freight, a substantial increase over the previous year. The number of private railway companies operating in Korea on March 31, 1927, was seven, with two companies constructing new lines. There was also three electric tramway companies operating 28.15 miles of line.

Sewer System for Tokyo Suburbs

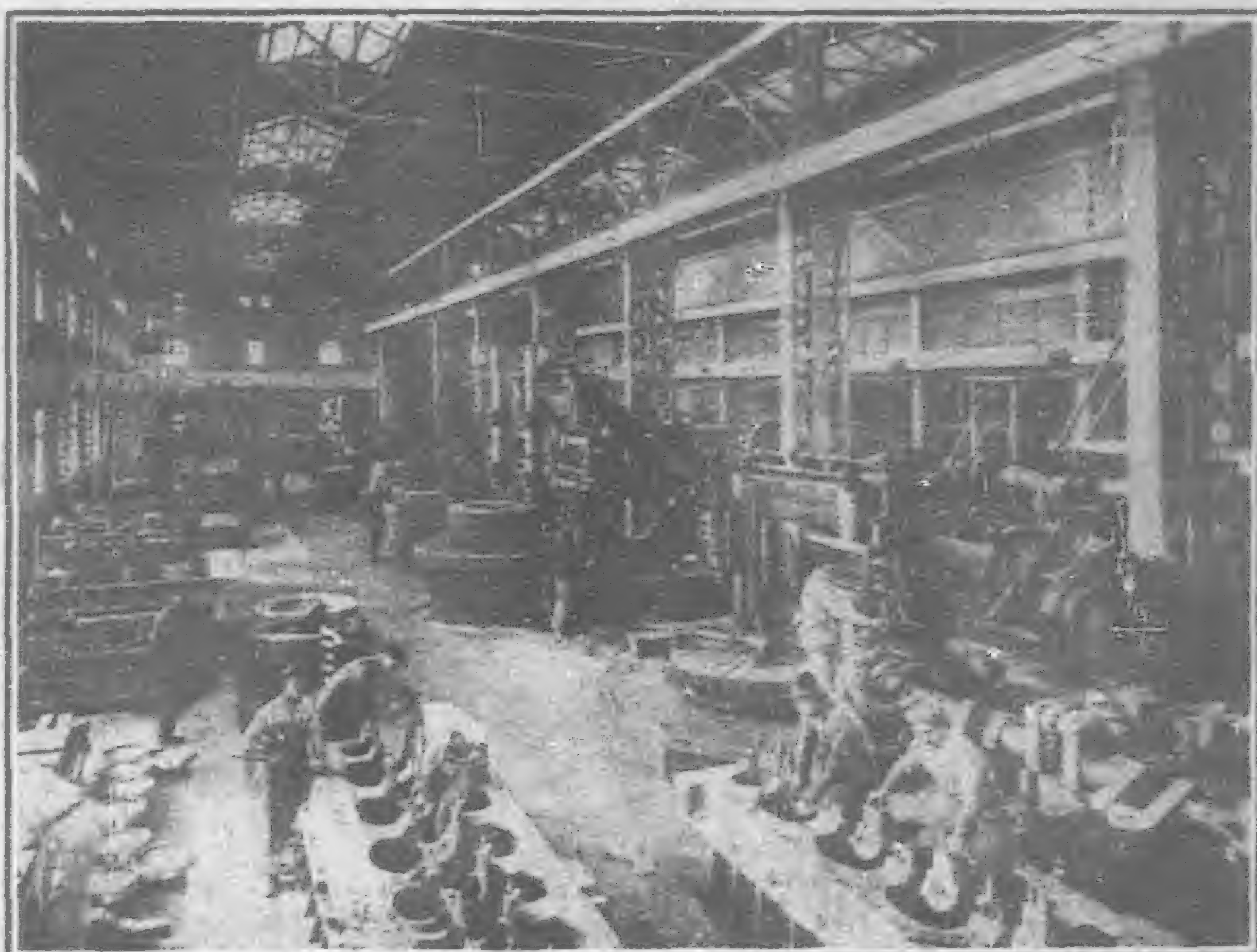
Plans for a great sewer system in Tokyo's suburban districts, involving an expenditure of nearly Y.1,000,000, have been decided upon by joint action of the Tokyo prefectural administration, the Tokyo municipal administration, and the Tokyo Bureau of Reconstruction Work. At its completion the people of 42 towns and villages will have a thoroughly modern sewer system. The work is expected to take approximately ten years.

Chuo Textile Co., Ltd.

A new company is being promoted by Toyoda Boshoku K. K., Toyo Menka K. K. and Mitsui Bussan K. K., to be known by the above name. The capital will be Y.1,000,000. The object of the new company is to manufacture export cotton cloth by using Toyoda automatic looms, and at the same time manufacture rayon mixed textiles for which Toyo Rayon will supply the material. The mill will be erected at Kariya Machi, in Aichi prefecture—site reported at 100,000 tsubo in area. The company expects to begin operations some time in June next year.



Foundry of the Kamata Works

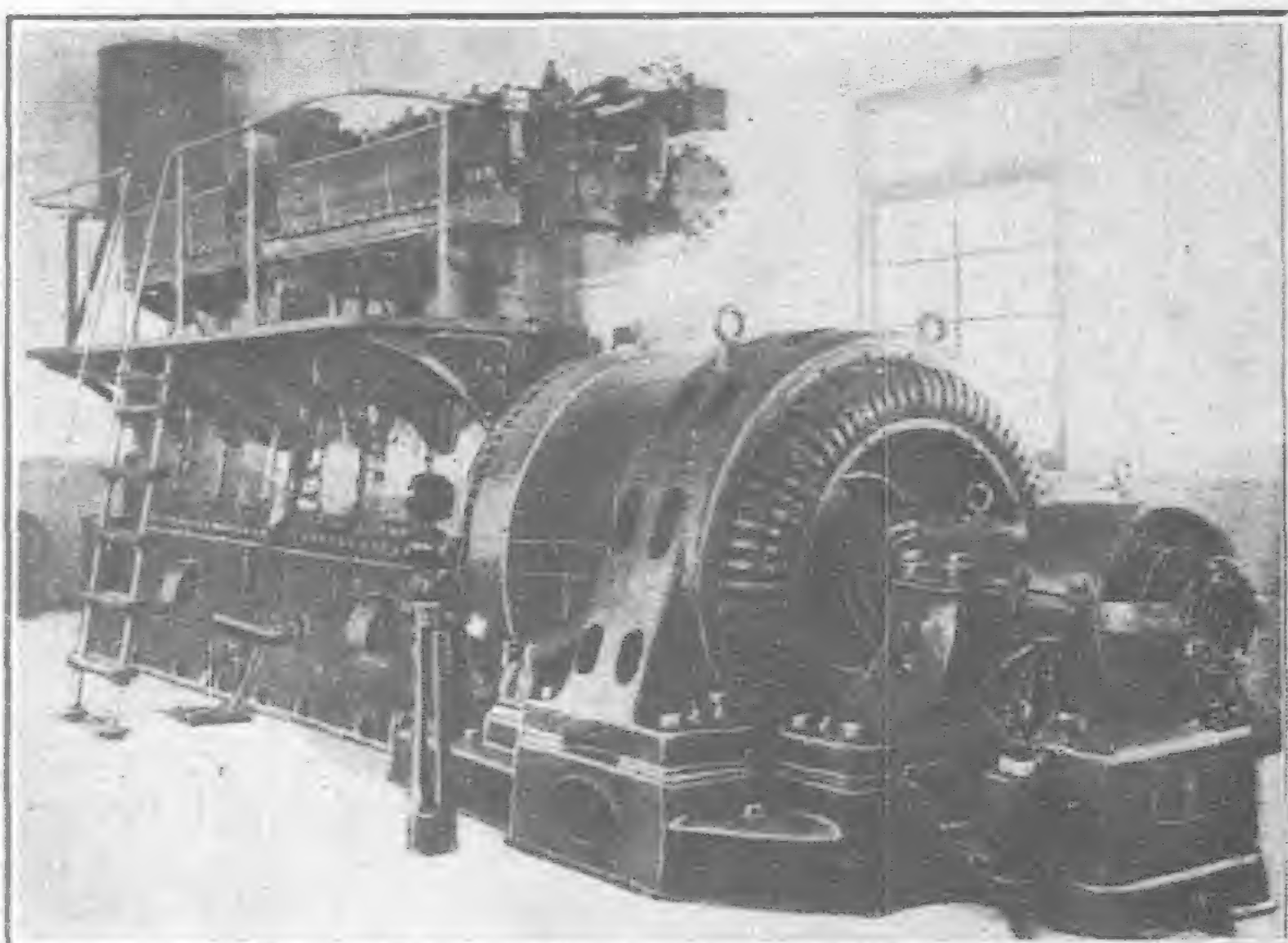


Finishing Shop of the Kamata Works

The Niigata Iron Works, Limited

IN 1895, the Japan Oil Company, Ltd. founded its works at Yamashita on the opposite side of the city of Niigata in order to manufacture and repair the machinery and tools for working the Company's oil fields as well as for refining the oil produced thereon. After the name of the city where it is located, the works was named the Niigata Tekkosho or the Niigata Iron Works, Ltd.

With the development of the oil industry, the works has been gradually enlarged, and the number of manufactured articles have been also increased, their market covering Japan, Korea, China and the South Sea Islands. In 1910, the works were separated from the Japan Oil Company, Ltd.,



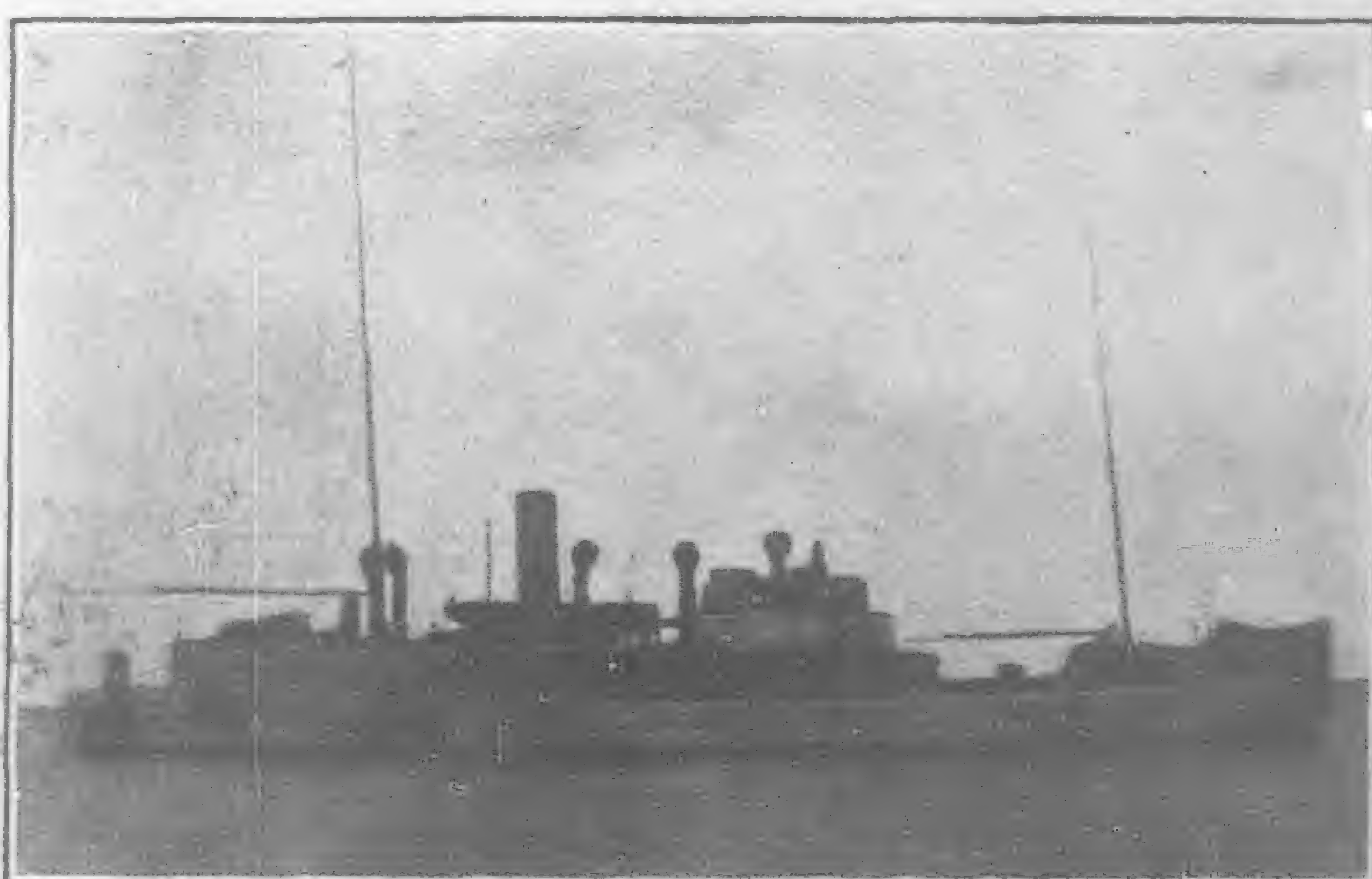
300 H.P. "Niigata" Diesel Engine Coupled with 250 K.V.A.,
3,300 V. Alternating Current Generator
(Supplied to the Shiojirizawa Electric Co., Ltd.)

and were incorporated as a joint stock company capitalized at Y.2,000,000. In the following year, the capital was increased from Y.2,000,000 to Y.5,000,000. However, as a result of the great catastrophe of 1923 by which the buildings of the Tokyo works were completely gutted, while the Kamata works were also heavily damaged, the capital was reduced from Y.5,000,000 to Y.4,000,000 of which Y.3,640,000 was paid up.

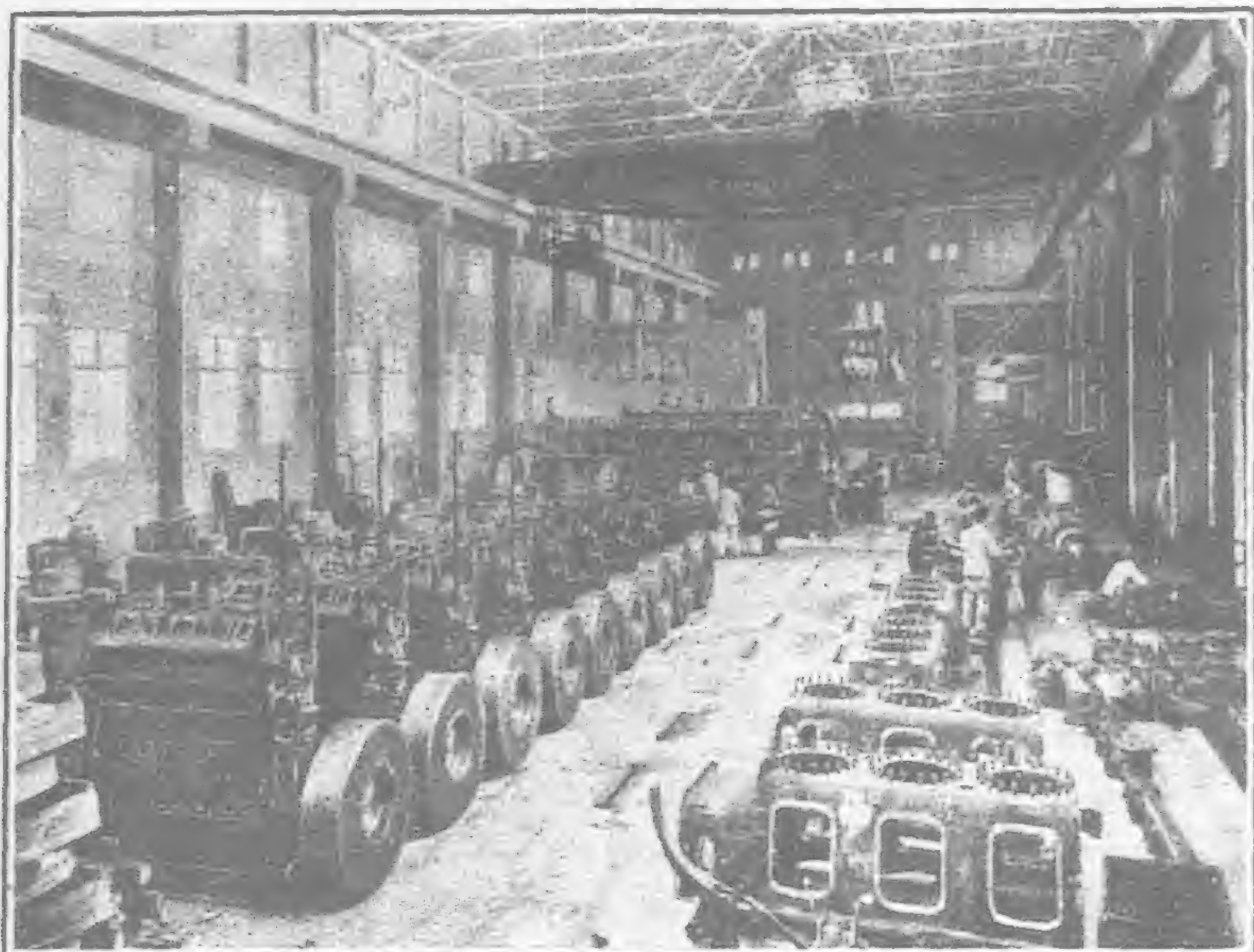
The Niigata Iron Works, Ltd. now operates the following works, namely, Kamata Works, Niigata Works, Kashiwazaki Branch Works, Nagaoka Branch Works and Tsuchizaki Branch Works. Of these, the Kamata Works is in the largest scale with the best equipment.



General View of the Kamata Works of the Niigata Iron Works, Ltd.



S.S. "Hakuho Maru" (300-ton) of Department of Agriculture and Forestry Equipped with 600 H.P. "Niigata" Diesel Engine



Erection Shop of the Kamata Works

The Outline of the Kamata Works

These works is located at Kamata Machi, Ebara-Gun, Tokyo. Adjacent to Kamata Station of the Tokyo-Yokohama Railway line, it is provided with railway sidings. The works has its building area of 4,400 "tsubo" and stands on ground covering 23,800 "tsubo." This was intended for the exclusive manufacture of internal combustion engines, but with the completion of the Internal Combustion Engine Department of the Tsukijima Works, Tokyo, of the same concern, all this work was removed to the new works. Soon after the great earthquake, the Machine Tool Department of the Tsukijima Works also was moved to the Kamata Works.

The Kamata Works consists of Internal Combustion Engine Department, Machine Tool Department and Foundry. In addition, there is an annealing workshop and a research laboratory.

Internal Combustion Engine Department

The workshop was constructed in 1920, and is well designed with up-to-date equipment. Through 30 years' experience gained by the engineers as well as workers, much improvement has been made on the quality of the manufactures, particularly of semi-Diesel engines which are now winning popularity.

In 1918, this company took over the patent right for manufacturing 4 cycles system Diesel engines from Merries Pickerton & Day Company, Ltd., England, and subsequently a number of the staff of the Niigata Iron Works including the Chief Engineer, engineers and workers were sent to England to learn how to design and manufacture the patent engines at the British works. They returned to Japan in 1920, in which year this company started manufacturing of the engines. Meeting demands, 155 engines with an aggregated capacity of 17,000 h.p. have been put on the market. With a view to manufacturing the engines of larger type, this company recently bought over the patent right for manufacturing 2 cycles engine from Nobel Diesel Company, Ltd.

Diesel engines manufactured at the Kamata Works are classified into the three types, namely: type for marine use, type for land use and type with larger horse power.

Type for Marine Use.—This is of vertical type with 4 cycles and is adaptable to fishing boat, trawler, salvage boat, tug and other vessels of smaller type requiring a high speed. The engines manufactured at this works have horse power ranging from 50 to 320 each. Up to the present, 108 engines with a total horse power of 12,365 have been manufactured to order.

Type for Land Use.—This is also of vertical type with 4 cycles. The high speed engine is

suitable for power plant on smaller scale and workshop as generator, besides it can be used as an auxiliary of marine engine. The low speed engine is of crosshead type and is very strong, adaptable to power, water, ice-making plant and others which require engine operating for a long time. More than 200 engines of this type including one with 500 h.p. supplied to the Electric Industrial Co., Ltd., one with 300 h.p., to the Tokyo Gas Co., Ltd. and one with 300 h.p., to the Railway Department have been manufactured at this works.

Type with Larger Horse Power.—This is a Nobel Diesel engine of vertical type, single stroke with 2 cycles which is suitable for vessels of larger type. For a generator of power plant and other plants, this can be used most effectively. With its present equipment, this plant is capable of turning out engines of this kind up to 4,000 h.p.

As to semi-Diesel engine, those for marine use with more than 15 h.p. and those for land use with more than 25 h.p. can be manufactured here.

Machine Tool Department

With the establishment of the Tokyo works at Tsukijima, Tokyo in 1913, internal combustion engines as well as machine tools were manufactured there. However, following the completion of the Kamata Works, the works at Tsukijima began to manufacture machine tools, which were mainly supplied to the Departments of Navy, War, Railway and other government offices. As a consequence of the earthquake in 1923, however, the workshops were completely destroyed by fire, and the department was removed to the Kamata Works.

The machine tools principally manufactured at the works are as follows:

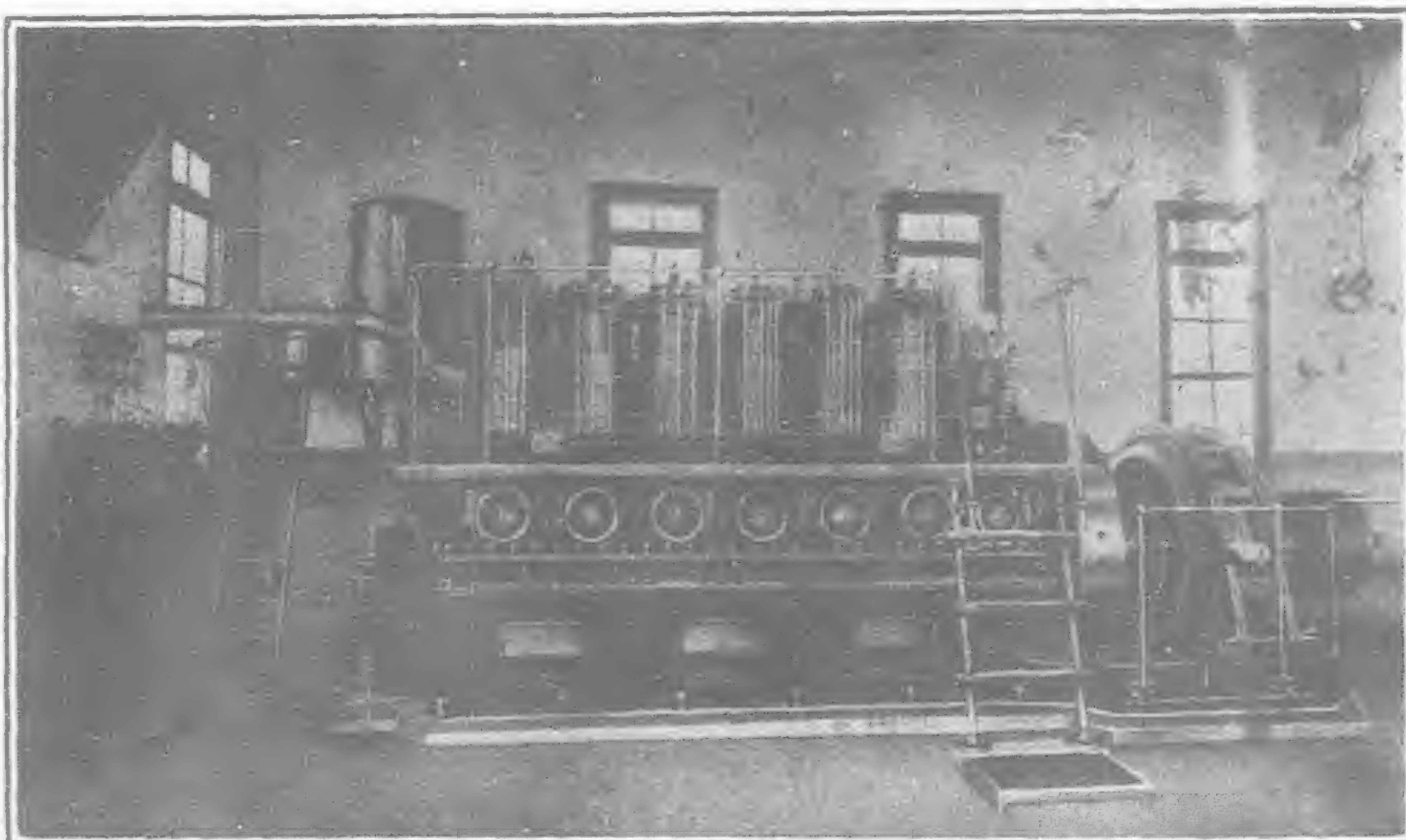
Engine lathe, heavy duty lathe, face lathe, universal turret lathe, turret lathe, shaping machine, planing machine, slotting machine, drilling machine, milling machine, vertical milling machine, steam hammer, pneumatic power hammer and vertical boring and turning mill.

Foundry

Under the supervision of an engineer who studied founding methods for years in Europe and America, the foundry is turning out the first grade articles which are being favorably commented upon. Cast iron, (semi-steel), brass, gun metal, and alloy are their specialities.

The following show the annual productive capacity of the Kamata Works:

Internal combustion engines	Up to the capacity of 20,000 h.p.
Machine tools	Up to the worth of Y.1,000,000
Founding capacity	Up to 2,500 tons for general cast iron and semi-steel, and 100 tons for alloy



220 H.P. "Niigata" Diesel Engine Connected to 15 Kw. Alternating Current Generator
(Supplied to the Daiko Electric Co., Ltd.)

The manufactures and their limits are as follows:

INTERNAL COMBUSTION ENGINE.

Diesel engines for marine and land use	Effective horse power for one set ranging from 30 h.p. to 3,000 h.p.;
Semi-Diesel engines for marine and land use	Effective horse power for one set ranging from 5 h.p. to 100 h.p.

MACHINE TOOL DEPARTMENT.

English and American type lathe	Length of bed, up to 50'
Planing machine	ditto 30'
Shaping machine	The largest type
Drilling machine	ditto
Turret lathe	ditto
Grinder	ditto
Milling machine	ditto
Turning mill	The diameter of table, up to 12'

FOUNDRY.

Cast iron and semi-steel	Up to 20 tons
Alloy	Up to 150 "kan"

Power for the workshops is supplied by one 150 h.p.d.e. 100 k.v.a. belt driven alternate current motor and one 150 h.p. 100 k.w. continuous current motor which is coupled with Diesel engine. In addition, there are one 675 k.v.a. transformer for power and one 90 k.v.a. transformer for light.

By means of a hot air heating system, the temperature inside the workshops can be kept as high as more than 55 degrees even in the coldest season.

There are water-supply arrangement with low pressure as well as high pressure pipes.

Generators installed in internal combustion engine workshops are of alternate current and continuous current, the former numbering 46 and the latter, 19. In erection shops, there are one set of 20 ton crane and 7 sets of 2 ton crane. Machine shops are provided with 3 sets of crane, 10 ton, 5 ton and 2 ton, and 171 of necessary machine tools including 90 sets of lathes, 15 sets of grinders, 10 sets of milling machines and others. The machine tool department is equipped with 5 generators, each 83 h.p., and 3 cranes, 3 ton each, and miscellaneous machine tools, 59 in number. The foundry has 20 generators, 5 cranes, one 1 ton elevator and 3 lifting trucks. In addition, 4 sets of blast furnaces, 5 alloy furnaces, 1 reverberatory, 2 blowers and others are found therein.

The Niigata Works

Located at Irifune-cho in the city of Niigata, the works stands on ground covering 45,644 "tsubo" with the building area of 6,672 "tsubo." At the works which has an annual productive capacity to the extent of about Y.2,000,000 worth, the following are manufactured:

Engine and boiler for marine and land use, steamer, sailing vessel, passenger and freight car for railways, oil tank, air compressor, pump, boring tools, dredger and machine tools.

Power is supplied from 24 generators and one 100 h.p. Babcock & Wilcox boiler.

The machine shops is on smaller scale as compared with that of the Kamata Works, but it is well equipped with 91 machine tools and other requirements.

Amongst the works of this concern, the Niigata Works is the only one provided with workshops for manufacturing and erecting cars, both passenger and freight. Two ship-building docks, one for 3,000 ton vessel and one for 500 ton vessel are found in the compound of this works.

The Kashiwazaki Branch Works

Kashiwazaki, Kariha-gun, in the Niigata Prefecture is the seat of this works, which stands on the lot covering 2,111 "tsubo" with the building area of 866 "tsubo." The specialities of this works comprise Rotary system drilling machine for oil fields, oil refining

machinery, oil tanks, engine and boiler, wax-making machinery, pressure pipes, oil-can manufacturing machinery, and hand and power-driven presses. As the generator of the workshops, one 10-in. by 20-in. engine and 3 80 h.p. generators are provided with. The machine shop has 40 machine tools including lathes, drills, planers, milling machines and others.

The Nagaoka Branch Works

This works which is situated in the city of Nagaoka, Niigata Prefecture specializes in machinery and tools for oiling purposes, engines and boilers, oil engines, paper making machinery, pumps and pressure pipes. The manufactures turned out in this works reaches about half a million Yen in amount yearly. Thirty-six sets of machine tools and one 46-in. by 12-ft. boiler and $\frac{1}{2}$ ton steam hammer are accommodated with the workshops.

The Tsuchizaki Branch Works

The annual production of this works amount to Y.500,000, its principal manufactures being pumps, pressure pipes, mining machinery, engines and boiler, oil machinery and wood working machinery. The works is located at Tsuchizaki in the Akita Prefecture.

Four de Havilland Gipsy Moths Ordered by Nanking

The newly established aeronautical department of Messrs. Arnhold & Co., Ltd., which is under the charge of Captain W. E. F. Jones, D.F.C., C.A.C., has just secured a contract to supply four de Havilland Gipsy Moth aircraft to the Chinese Aviation Bureau at Nanking.

The British Gipsy Moth was decided upon after the technical qualities of various aircraft were examined very minutely by Chinese Aeronautical specialists in the light of fullest possible service for operation in China. These aircraft are exactly similar to the Gipsy Moth aircraft recently sold to the Aviation Bureau in Hankow by this company.

It is further interesting to note that these Moth aircraft are all to be fitted with the Handley-Page automatic slotted wing control. This new patent slot when attached to aircraft very considerably increases the stability of the aircraft in flight and very considerably reduces the possibility of a crash through stalling the machine, and also has a remarkable effect on minimizing the possibility of a spin through the loss of sufficient lifting force on either wing of the aircraft due to technical error on the part of the pilot or for a number of other reasons common in aeronautics.

It is also interesting to note that these Gipsy Moth Aircraft can be converted for operation from the land or from water by simply changing the undercarriage, which is a matter of about one hour's work.

Four New Coast Guard Cutters for the Philippines

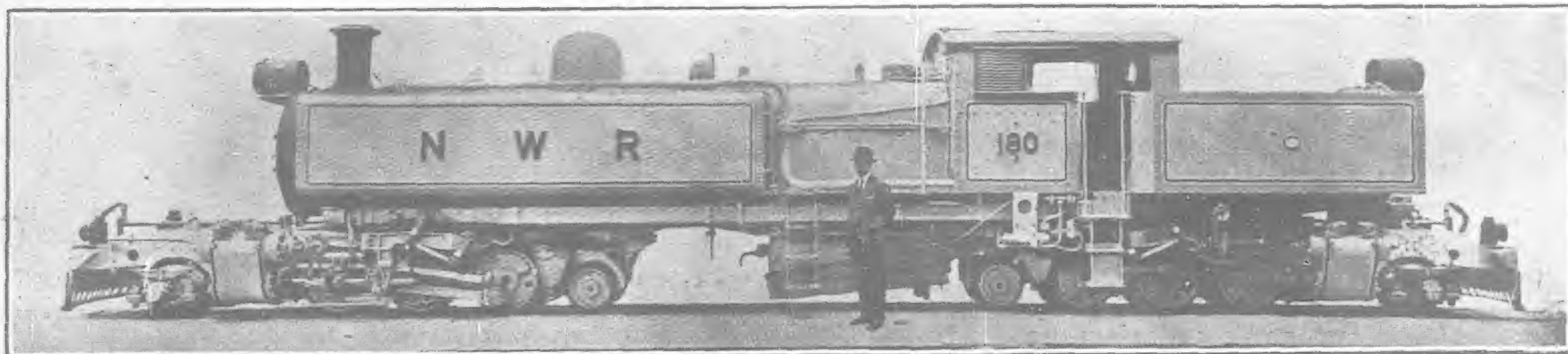
ADVICES from Manila, state that bids for the construction of two vessels for coast guard service in the Islands will be advertised by the bureau of commerce and industry early next year in Shanghai and Hongkong and probably in a few Japanese cities. The Governor General recently approved the bill appropriating P.1,000,000 for the purchase of four new cutters.

The new cutters will have a gross tonnage of about 500 tons and a speed of from 10 to 12 knots.

Preliminary arrangements have been made between the bureau of commerce and industry and local agents of large shipbuilding contractors in Hongkong and Shanghai.

The two proposed cutters are to be finished by about the middle of next year. Each will cost about P.50,000 for the equipment and other supplies. The two other cutters as provided in the bill recently signed by the Governor General will be constructed in 1930.

The original bill recommended by the director of the bureau of commerce and industry asked for the purchase of six cutters. The Legislature, however, voted for only four new cutters.



2-ft. 6-in. Gauge Kitson-Meyer Locomotive Built by Kitson & Co., Ltd. of Leeds, England, for the Kalka-Simla Railway

Kalka-Simla Railway—Kitson-Meyer Locomotives

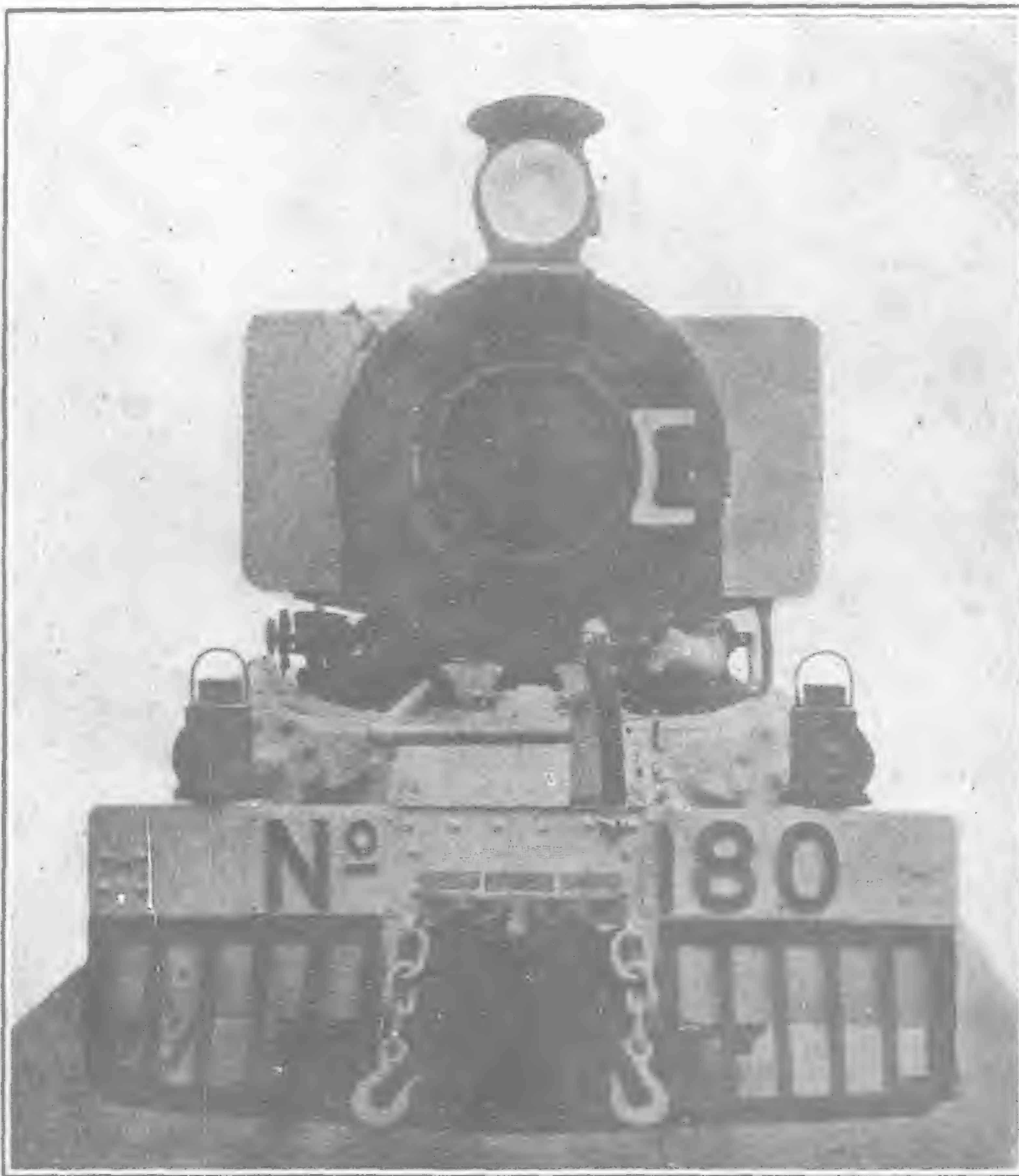
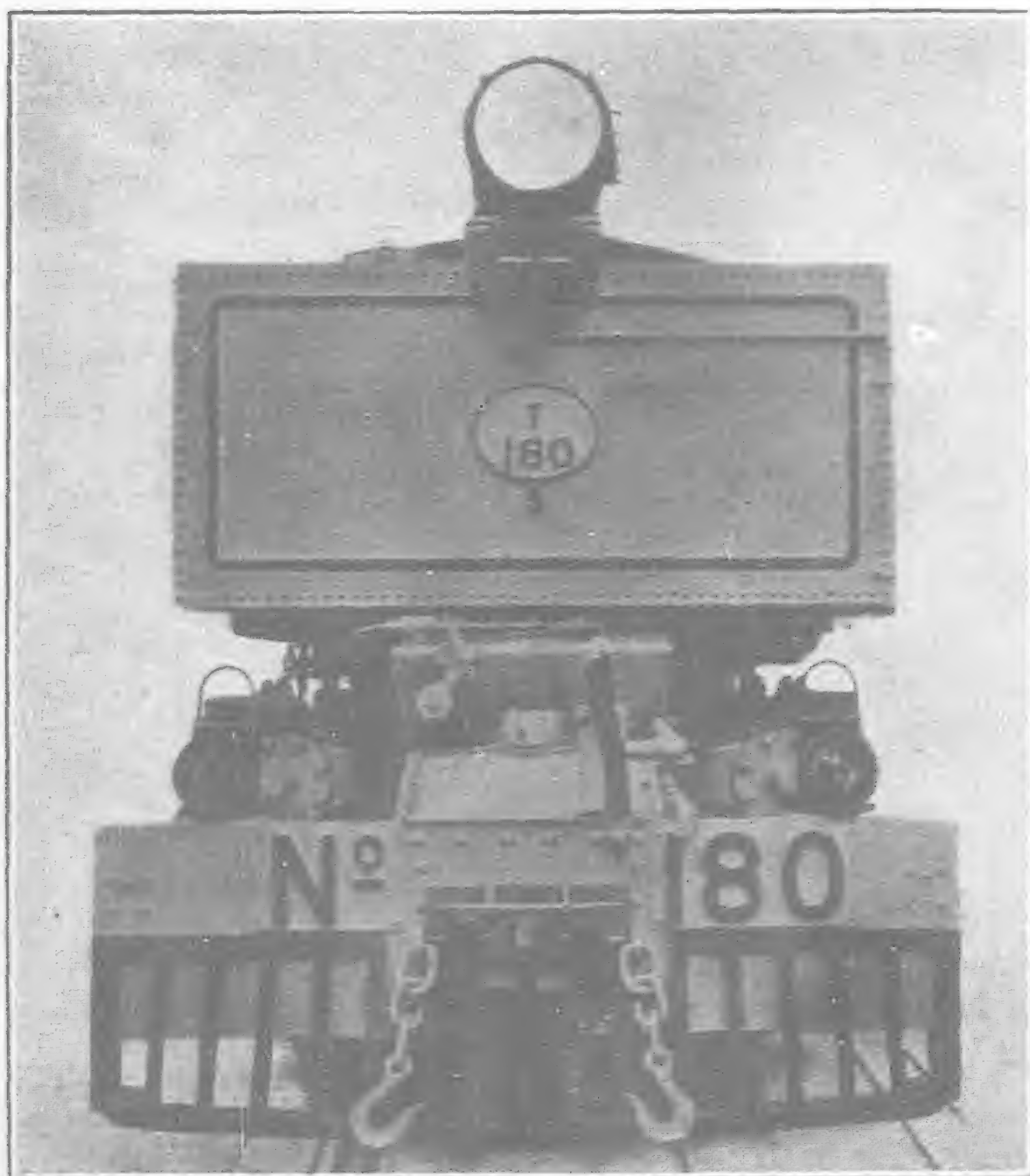
THE Kalka-Simla is no ordinary railway. In some 60 miles it rises over four thousand seven hundred feet, literally wriggling its way through mountain passes and around unscalable precipices. It is full of sharp curves and steep inclines, and there are no less than one hundred and two tunnels on it. A glance at the profile and plan which we give will convey to the engineer some idea of the problems which it presents. For such a railway no ordinary locomotives are needed; something quite of the way in flexibility is demanded. Hence, when new and more powerful engines were required, it was decided to use the Kitson-Meyer type, and in conjunction with Messrs. Rendel, Palmer and Tritton, of Westminster, Kitson and Co., Ltd., of Leeds, prepared the designs for, and have constructed two remarkable engines.

Some time ago we had, through the courtesy of the builders, an opportunity says "The Engineer" of seeing the first of these engines put through shop tests. A short length of line bent into an S with considerable super-elevation had been laid down, and the engine was run backwards and forwards under her own steam. Of course,

speed was out of the question, and the test was really one of flexibility. The total wheel base of the engine is 44ft. 10in., long enough to extend over the greater part of the double curvature. Hence whilst the forward engine was turned, let us say, to the right and twisted by the corresponding super-elevation, the after engine was turned and twisted in the opposite direction; the maximum twist, however, was not obtained with both ends at once.

This extraordinary flexibility is the outstanding characteristic of the Kitson-Meyer system. It is secured, as is well known, by the use of double spherical joints in the steam and exhaust pipes combined with a careful arrangement of clearances, a type of axle-box which permits considerable movement in the hornblocks, and a spherical bolster which gives the "bogies" freedom to take up any necessary angle.

The gauge of the Kalka-Simla Railway is 2ft. 6in. with gradients up to 1 in 25. The radius of some of the curves is as little as 120ft., but the road is widened $\frac{3}{4}$ in. on them. The change in sense is in some cases so sharp that there is no straight between opposing curves. As the engines have to take these turns at a fairly high speed, a

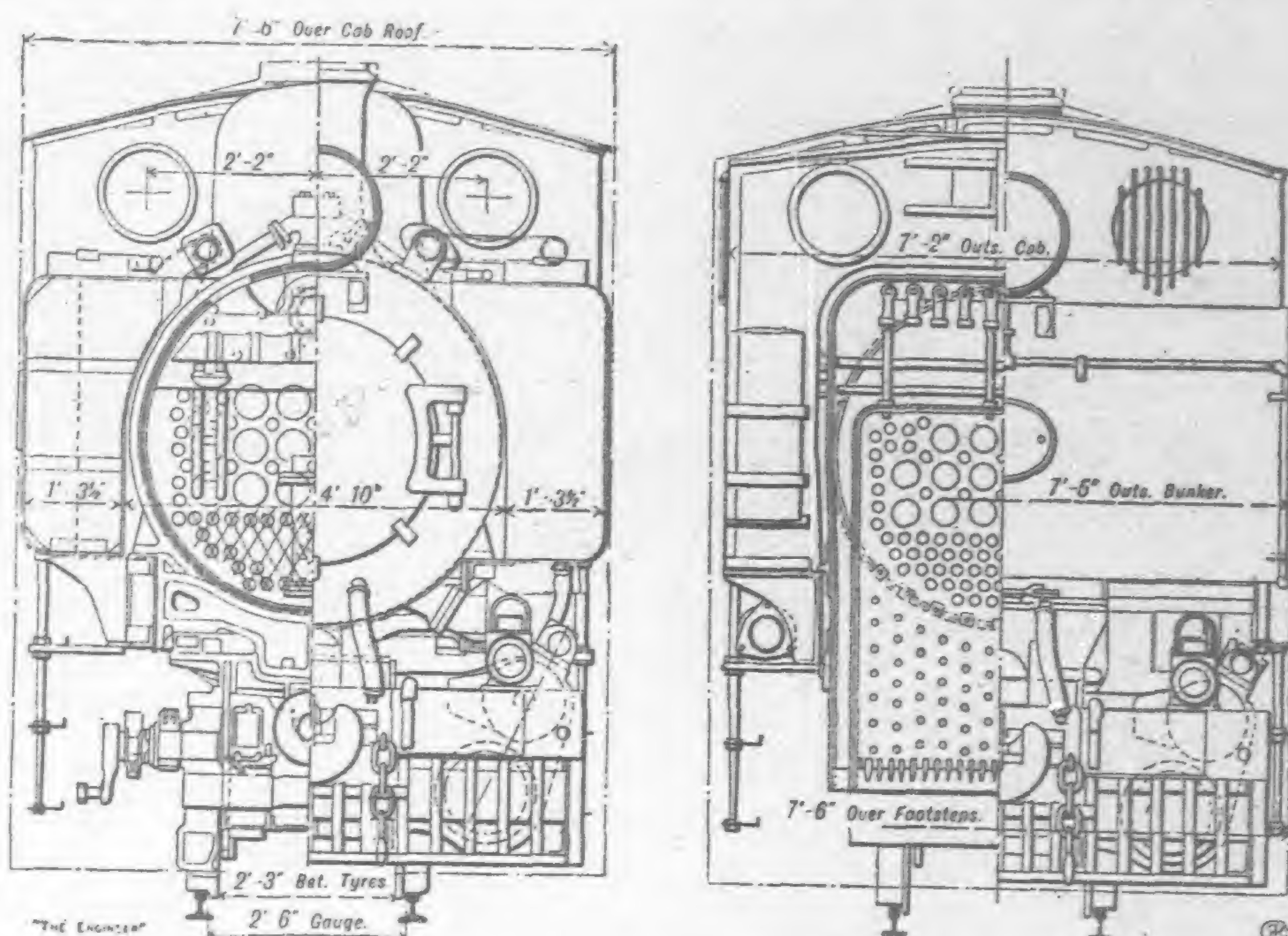


Kalka-Simla Railway—Front and Rear Views of Kitson-Meyer Locomotive

super-elevation of 3½ in. is given to the outer rail. The distance between the bolsters or pivots is 26ft. 3 in., and that the wheel base of each engine is 15ft. The cylinders are 13½ in. by 14 in. The engine has side and bunker tanks, the former carrying 950 gallons and the latter 400 gallons of water. Bunker space for 3 tons of coal is provided. The boiler, which is fitted with a 212 square feet superheater has a total evaporative surface of nearly 1,015 square feet, and a grate area of 27 square feet. The blow-off pressure is 180 lb. per square inch. The arrangement of the flexible joints in the steam and exhaust pipes can be seen in the forward engine. In the trailing engine a modification had to be made, since the steam has to be taken to the rear from the header and the exhaust has to be carried forward to the blast nozzle.

A word must be said about the driving wheels. It will be noticed that none of them are blind, they all have flanged tyres, but owing to the heavy wear caused by the sharpness of the curves, the contour of the flanges is much fuller than usual, the familiar radius at the top being reduced to little more than a rounding off of the corners.

We venture, says "The Engineer" from our own inspection, to congratulate the makers and the consulting engineers on the production of a really remarkable engine, remarkable for the train loads—exclusive of the locomotive—it is expected to haul, upwards of 160 tons, on a road which



Kalka-Simla Locomotive—Cross Section

is about as difficult as possible to imagine and up steep gradients at a speed of over ten miles per hour, and for a flexibility which has to be seen to be believed.

Japanese Oil Exploitation in North Saghalin

NOTABLE progress has been made by the North Saghalin Oil Co., Ltd., which was formed in June, 1926, for the purpose of exploiting oil concessions obtained in Moscow by Vice-Admiral Juli Nakasato, now its president. According to Trade Commissioner Paul P. Steintorf, Tokyo, the company drilled eight more wells in 1927, bringing the total in production to 19. At the end of the year it was pumping 17 wells. The 1927 output amounted to 68,700 tons—a figure considerably higher than the estimates of oil experts, but, according to the author of the article, obtained direct from the producing company. This tonnage, moreover, was equivalent to one-quarter of the production of Japan proper and Formosa. In comparison, the 1925 output amounted to only 28,400 tons.

A résumé of the article, which has been checked carefully and apparently represents a reliable statement of developments in north Sakhalin, follows:

According to the terms of the concession agreement, the eight proved fields—Oha, Yehabi, Piritsuun, Nuto, Chaiwo, Niivo, Wivrek, and Katangury—are divided into checkerboard squares, each with an area of 83.7 acres. The Russians will have the black and the Japanese the white squares, and the success of either depends largely on getting down offset wells to drain the other's territory. As the areas range in size from Wivrek, just under 800 acres, to Oha, with practically 2,500 acres, speed in drilling is one of the prime essentials.

Half of the Saghalin oil territory is held by the Japanese and half by the Russians. In addition, the Japanese interests are allowed to prospect over other delimited areas of 1,000 square versts, or 439 square miles (231,232 acres), which adjoin the present fields. At the end of 10 years, in 1936, the company may have concessions on half the additional area it is to prospect.

Oha the Only Producer at Present

So far Oha (the farthest north) is the only field in production, and all the 19 producing wells are there. Throughout the archipelago, of which both Japan and Saghalin are parts, the pressure is poor and the oil sands are rather near the surface. The north Saghalin company prefers to conceal the depth at which it finds

the sands, but is willing to admit that not even test borings have gone below 180 meters, or 591 feet. Within this range five strata of oil sands have been discovered and only the two top strata have been tapped by wells.

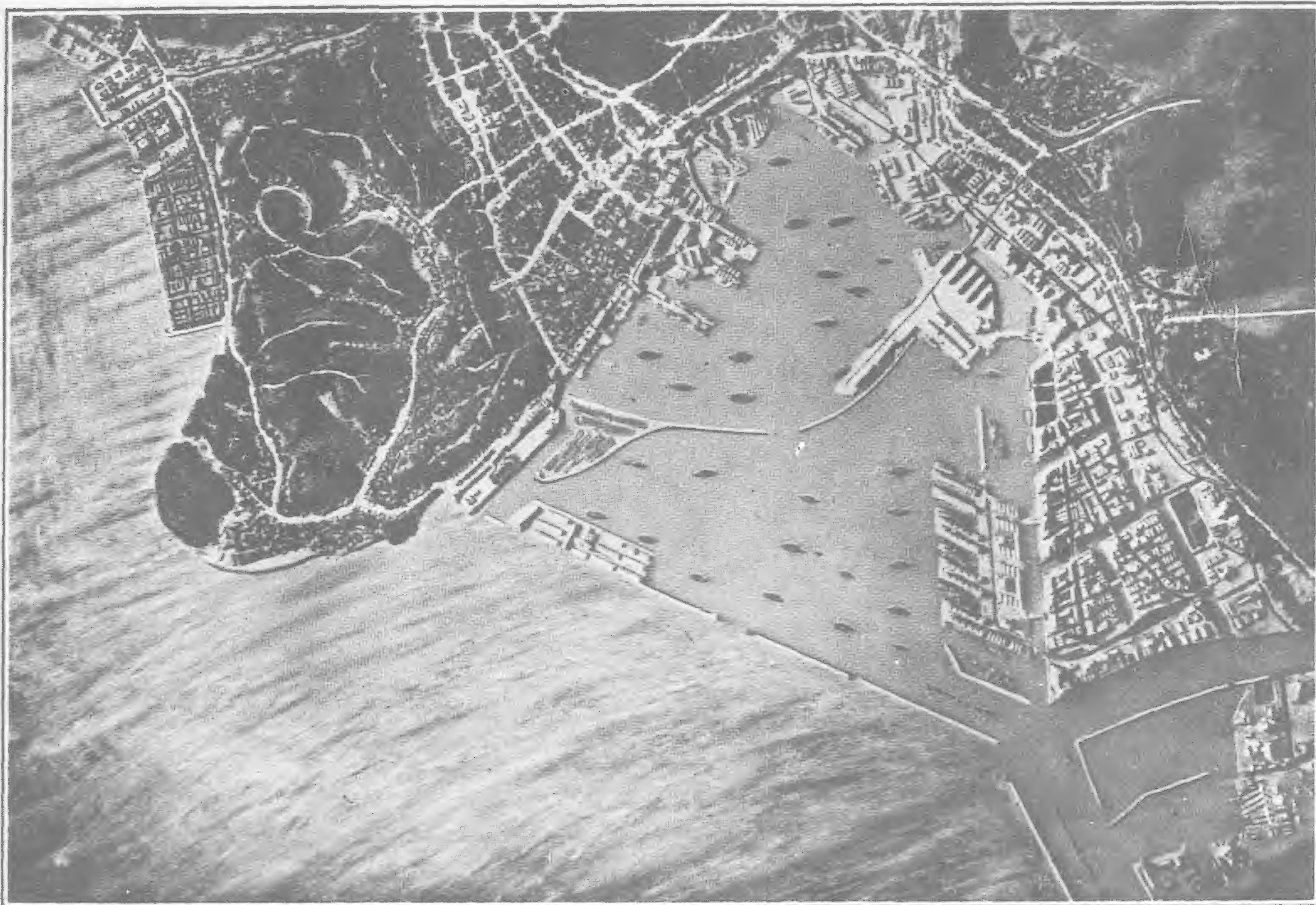
No gushers have been brought in. As a matter of fact, none of the wells will flow by itself. There is practically no gas to aid in lifting the oil at Oha, and the black liquid is brought to the surface by pumps. At Nuto, however, the company is doing some prospecting and has found some dry gas. One or two wells were being drilled there early in 1928. It takes about 30 days to drill a well by the American cable method. Incidentally, only 17 of the 30 wells the company has drilled are on production, which appears to indicate that the shallow holes drilled so far have little in them.

Success Despite Handicaps

Only Japan's determination to supply a larger portion of its own petroleum needs has made possible the Saghalin development. In the first place, half of the higher officials in charge of operations must be Russians and, of the lower classes of workers, only 25 per cent. can be Japanese. The Japanese employees, as a rule, do not speak the Russian language and the Russians do not speak Japanese. Few Japanese, moreover, want employment in a climate which differs radically from their own.

In the second place, the eight proved areas are on the eastern end of the extreme northern coast of Sakhalin Island. The lakes which pit the entire shore are extremely shallow and not even 1,000-ton tankers are able to enter. The tankers originally had to anchor a mile off shore and have the oil brought to them in lighters. In 1927, however, a 4-inch pipe line along the sea line to the anchorage a mile out at sea proved highly successful and shipments were increased.

The company has done well, considering the great handicaps imposed, and Admiral Nakasato reports that work is proceeding with less friction. During 1928 it intended to increase production to 133,000 tons. Since shipments can be made only from the end of June to the end of September, a large tank capacity is required. Tanks now at Oha have a capacity of 82,000 tons.



View of the Port of Yokohama Showing the Proposed Reclamation and Outside Breakwater

Yokohama Harbor Extension

By Mr. Shidzuo Hara, Superintendent of the Harbor Department of Yokohama City

1. The Work of Forming the Industrial Zone by Reclamation

YOKOHAMA city is most seriously affected by the rise and fall of the port owing to the fact that the city is dependent upon the port and harbor. However, the trade of this port has a tendency of transit and industrial progress upon which depends the economic foundation of the port and harbor has not kept step with the times. Considering this fact from the standpoint of the fundamental harbor policy, Yokohama city decided to create an industrial district by means of reclamation, taking advantage of the following facts, i.e. having a very large consuming district in her hinterland, ample labor to be supplied easily, and geographical superiority. This industrial new land will be available for good terminal facilities, and this land may be negotiated for at a lower price, because the city is inviting as many industries as possible.

The area of public water surface which is to be reclaimed for use of the industries is 2,120,459 sq. meters. The expenditure is estimated at ¥14,830,019 for seven years' continuous work. A survey and investigation was made in 1927, and the work will be completed in 1933. This reclamation place is situated at the estuary of the Trurumi river and is divided into three large districts. Each district has landing stages for cargo at the end of every road, and a canal that has a width of 80-91 meters, average depth of over 2½ meters through that land. As the depth of the surrounding reclaimed land, the center of the canal, and the sea surface in front

of this reclaimed land are different respectively, anybody who wishes to buy this land in order to make a quay on his own account and take the risk in the degree of depth of the sea surface in front of reclaimed land, may negotiate with the city authorities regarding the contract, and if this negotiation is carried out before the completion of the city's work, then Yokohama city will deal with this matter under the special favor.

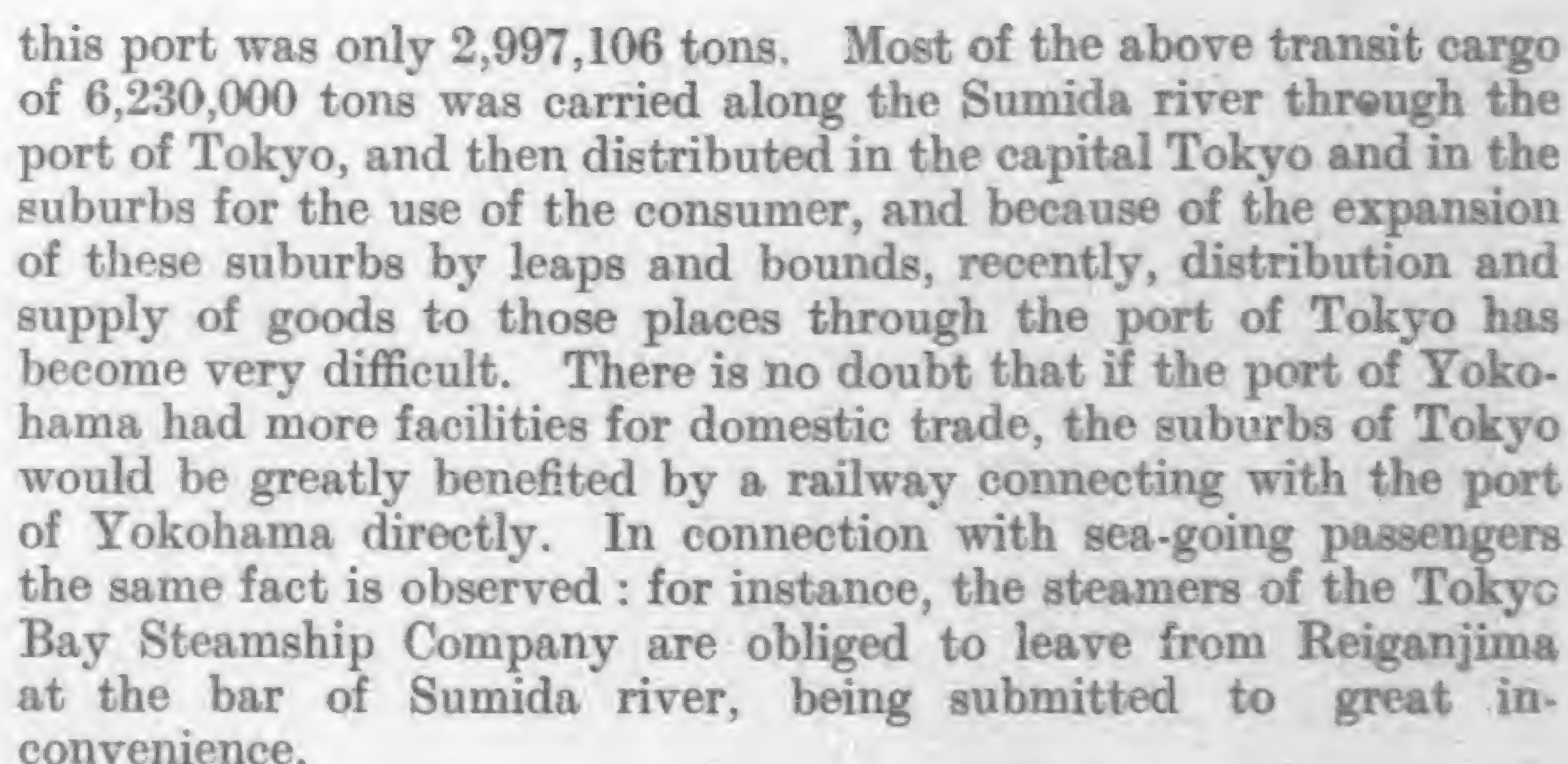
The available area of industrial premises is 1,634,649 sq. meters, and this is divided into 40 districts, each district's area consisting of minimum 14,604 sq. meters and maximum 89,485 sq. meters and average 40,866 sq. meters. Surrounding these divided lands the canal runs, and railway and high road are connected at the back. The road having width 11 meters to 25 meters is planned between the districts, and a side-walk is added to the road of over 15 meters in width. The landing stages of cargo for public use will be constructed on the beach when road connecting with the other roads and five main roads 25 meters in width and one main road 22 meters in width will be made in order to connect with between industrial zone and the Keihin High road. (Tokyo, Yokohama high road.).

With regard to the future railway, it is planned to run it through the second and first districts, to the operating depôt that is planned in the third district, to connect there with the belt line which will run to the pier in front of the reclaimed land.

Expecting completion of the terminal facilities, Yokohama city will prepare the land as ideal premises for industry, and will sell or rent it at real net price, if anybody proposes to the city

Notwithstanding that the volume of domestic trade totaled 9,235,000 tons in 1927, two-thirds of the total amount, that is, 6,235,965 tons, was handled as transit cargo which was transported to and from Tokyo without landing this port, and the actual domestic cargo of Yokohama which was landed and shipped in and out of

The present port facility of Yokohama seems to be insufficient as regards the accommodation of entering vessels, movement of cargo, and ability of loading and discharging due to gradual development of foreign and domestic trade. Owing to the fact there is



If the accommodation of the Yokohama harbor could be available for those steamers, almost all passengers coming down to Yokohama or going to Tokyo by electric car, could embark and leave the ship very easily.

For these reasons a part of the third extension work is expected to turn to the domestic trade accommodation for which details are as below; area of reclamation 112,148 sq. meters, mooring quay 422.87 meters, small scale slope quay for cargo landing stages 136.36 meters, wharves one of which has a length 145 meters width 39 meters, another a length 130 meters width 25 meters, and two others a length 145 meters width 53 meters (these latter two wharves are reserved to be undertaken in future). When this work is completed eight vessels of 3,000-5,000 tons type can be moored at the same time, and over one million tons of cargo can be handled in one year. The central wholesale commodities market is now under construction on that reclaimed land, and cold storage and other various accommodations are included. Fish, beef, vegetable, fruits and other provisions will be stored in this market and distributed simultaneously from there in all directions, and then the utilization of Yokohama harbor for the domestic trade will become very important.

The budget of the third extension work is estimated at Y.13,450,000 of which the expenditure of Y.5,222,000 is to be defrayed by the city, and, besides roads which connect with the harbor compound, sheds, warehouses, railway on the reclaimed land are expected to be a charge upon the Yokohama municipality, and the expenditure for the belt line was estimated in the budget of 1928 by the Railway Department, and the branch railway to the reclaimed land has been started and is now progressing.

3. The Work of Lumber Depot

During the year 1927 over 628,000,000 B.M. of lumber was imported in the port of Yokohama. In quantity, lumber has the second rank among the imported articles in Yokohama following coal, and it has a remarkably increasing tendency. Since the space of the harbor available for holding lumber in rafts is too narrow, and its accommodation and facility is insufficient, some of this lumber has had to be placed at the berth inside of the harbor. Owing to the fact that a certain part of the harbor to be used for anchorage could not be used due to the disturbance of ships' proceeding and cargo working, the distribution of lumber, of course,

became a very great inconvenience, and the foreign and domestic trade has been affected seriously.

In order to avoid this disadvantage, the city has decided to construct the breakwater of length 1,081.21 meters, enclosing a water surface of 434,070 sq. meters, at the outside of eastern breakwater where rafts may be kept safely, and moreover, 137,272 sq. meters of connecting sea surface will be reclaimed for use of lumber mills, and various other accommodations. This lumber depôt will be equipped with complete sea and land facilities for lumber distribution. Clearing lumber in the inner harbor of the breakwater and increasing the public utilization for shipping business, the city expects to realize the perfect port and harbor. The expenditure for this work is estimated at Y.1,330,000 and its completion is expected in 1930.

4. The Work of Resident Quarter

In Yokohama, the reconstruction work on roads, canals, harbor, public offices, schools, parks, etc. is about to be completed, and also the work of the industrial zone, which is Yokohama's heart from the economic view-point, has been started.

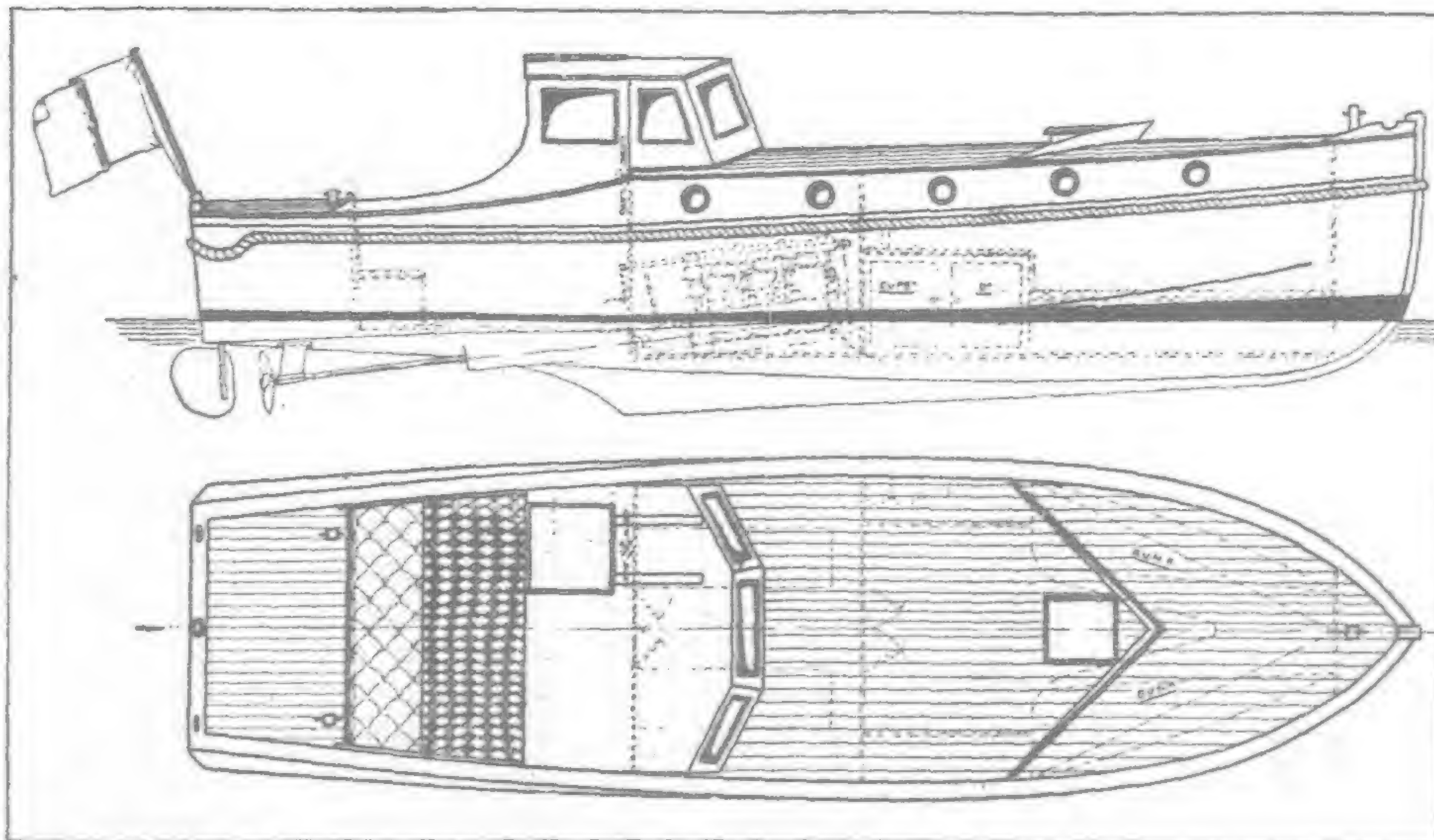
Taking advantage of this chance, the city has planned to make a reclamation of 694,217 sq. meters at the public water surface in front of Negishimachi, in order to furnish an ideal resident quarter for both foreigners and well-to-do citizens. This quarter is situated at the southern part of the city beyond the hill, where a lovely view of Tokyo Bay can be commanded. It has a cliff at the back, northwest, and the front faces on the sea in a south eastern direction. It is self-evident that the said quarter will be very healthful, and is expected to be an ideal resident quarter when the work is completed.

The total expenditures of this reclamation work are estimated at Y.4,100,000, and it will be dealt with as a continuing work of five years. This quarter will be equipped with a beach promenade road, having a width of 40 meters, a main road having a width of 18.18 meters, a branch road having a width of 9.09 meters, and also a small park having an area of 3,966 sq. meters, and it will be divided into 16 districts. On both sides, two small breakwaters will be constructed, embracing the area of 19,834 sq. meters, respectively, in order to accommodate vessels there, and that space will be available for fishing and pleasure boats.

A 15-Knot Customs Launch

28-ft. Craft Fitted With Two 28-36 h.p. Six-cylinder Motors

THE Ailsa Craig Motor Co. have recently received an order for a 15-knot launch for the Japanese Customs service. The hull will be of double skin teak, vee-bottomed design, measuring 28 ft. overall, 7 ft. 6 ins. beam and having a draught of 2 ft. 6 ins. A capable sea boat has been called for, together with accommodation for two people. The after-part of the boat is devoted to a cockpit having an athwartships seat, whilst the forward end is well sheltered by means of a permanent roof with windows forward and at each side. The helmsman is



A Fast Twin-screw 28-ft. Launch.

accommodated in the usual position on the port side, the engine controls being adjacent. The power plant consists of a pair of six-cylinder 28-36 h.p. Ailsa Craig motors. The machinery is bulk-headed from the forward cabin, which is equipped with a pair of bunks and the usual cupboard and lockers. We reproduce plans of the boat, which has a distinctly business-like aspect. Entrance to the forward cabin is by means of a hatch to the deck above, which is protected by a breakwater. The combined thickness of the teak plank referred to is $\frac{5}{8}$ -in.



Part of Coolie Settlement at Lao Boeah with Railway Trestle to Coal Sheds and Loading Berths

Coal Mines and Oilfields of the East-Borneo Coal Company

General Description of the Company's Property

THE East-Borneo Company Ltd. Collieries are situated close to the chief town of the Sultanate of Koetei, Samarinda, East-Borneo, and along and parallel with the banks of the majestic Koetei River, which river is navigable for many hundred miles inward for vessels not drawing over 17 ft. One mud bar outside the mouth of the river and one inside at the entrance, form an obstruction for the entering of vessels with a deeper draught. The close proximity of the mines to such a big river as the Kutei, or Mahacam, as it is also called, is a great advantage. Above the delta, the river measures 500 to 1,000 yards and offers excellent berthing to even large steamers of 4,000 tons D. W. quite close to the banks. Unfortunately the arms of the delta are less navigable, so that only steamers of 17-ft. or by high tide=17-ft. 4-in. draught can pass.

The East-Borneo Company possesses vast coal and oil concessions in the Sultanate of Koetei, East-Borneo.

The principal coal-concessions extend on each bank of the big Kutei-river over a width of 3,000 yards and along this river over a length of 45 miles; from the beginning of the delta up to three miles above Tenggarong, the native capital of Kutei.

The Company also possesses coal-concessions near Sebulu on the left bank of the Mahacam 10 miles to the North of Tenggarong and near Bungalum river, half-way Sangkulirang bay. These vast concessions and free-holds extend over an area bigger than the Durham or Northumberland districts in England and the deposits of coal found in this area may be safely estimated as well-nigh inexhaustible.

A Royalty

The principal oil-concessions Muara and Pelarang have been ceded to the Royal Dutch Oil Company, against a royalty of f 1.25 per ton oil.

Production

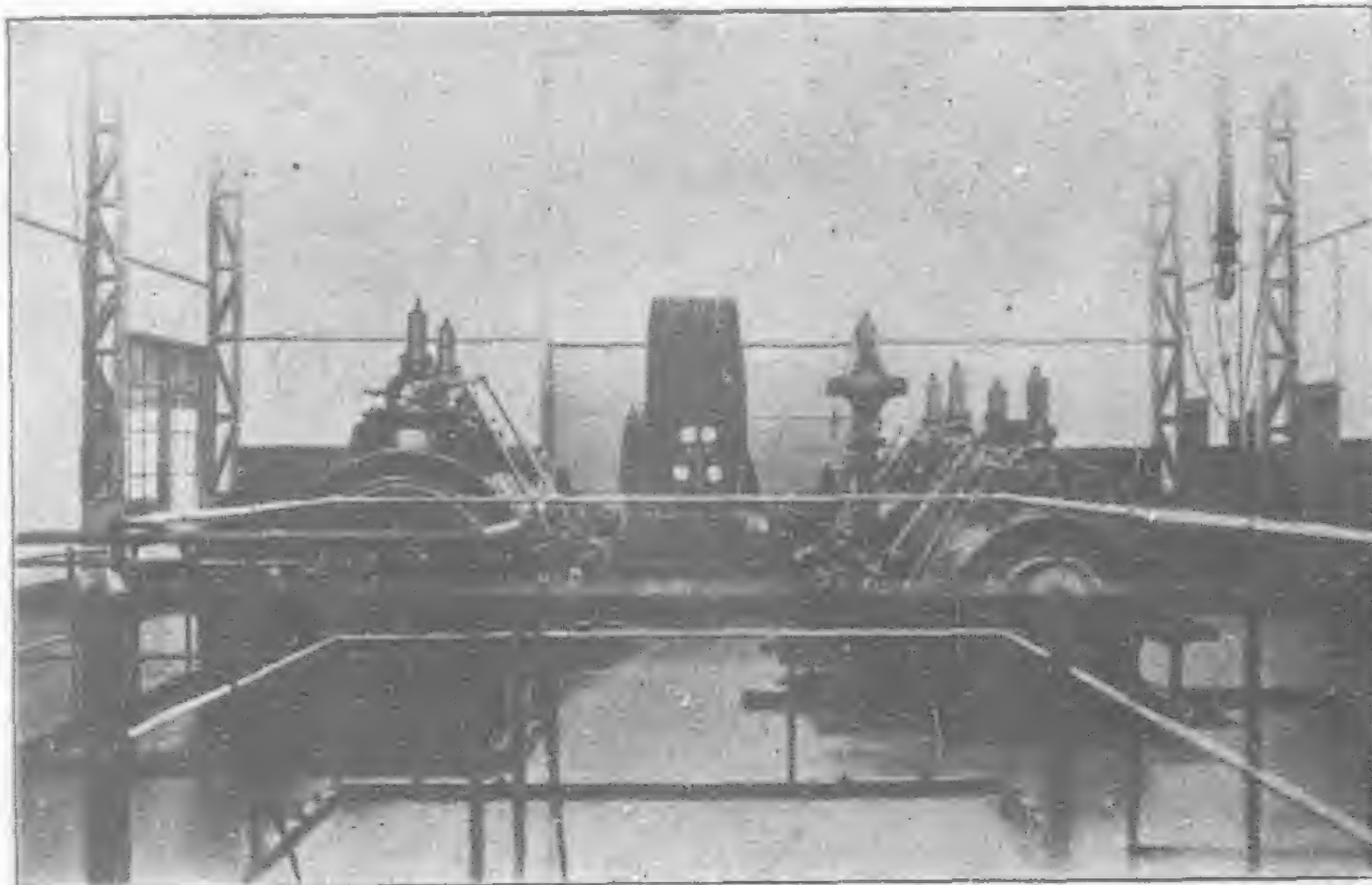
The production, respectively shipments of coal and oil during the last seven years aggregated:

	Coal tons	Oil tons		Coal tons	Oil tons
1918	36,365	77,634	1923	122,191	271,570
1919	36,664	69,655	1924	171,775	169,595
1920	33,446	100,313	1925	207,000	223,880
1921	64,061	128,443	1926, first		
1922	82,120	245,454	six months	122,000	104,410

INCREASE OF PRODUCTION.—As shown above, the development of these collieries only dates back a few years and the actual output already aggregates over 250,000 tons per year, whereas at the present moment important improvements are in progress, amongst which the erection of a big Power Station, inaugurated in the beginning of April of last year, for the electrification of the whole system of haulage, pumping, mining, mechanical traction and loading, and the electric lighting of the townships of Samarinda and Tenggarong etc., by which it is estimated that the output will be doubled within a year.

Oil

The oil-interests of the Company are principally ceded



Electric Power Plant at Lao Kulu Colliery



Entrance Pit—Shaft and Boiler House

to the Royal Dutch, but there are still concessions and licenses obtainable from the Company, for further exploration of the Company's possessions.

History

From 1903 to 1918 the coal mines were worked by Chinese or native contractors. Since 1918 mining and development has been centralized and concentrated in three places. At present the Company has in exploitation three pits, namely the "Loa Boeah," "Loa Kulu" and "Perdjiwa," which have since grown to settlements of considerable size.

In the afore-named places the coal seams are abundant, the slope of the seams only 10—15, and the country undulating, so that a large quantity of coal can be mined above the level of the Kutei river. The seams are cut by adits and the coal mined in the ordinary way. It is screened and transported to the store-houses on the bank of the river. The distance from the mines to the river never exceeding one mile.

Quality of the Coal

The richness in coal is fabulous, but the seams of the upper strata contain a coal that is not fit for export as the moisture is too great. Only the coal measures of the lower strata is therefore worked.

The coal seams in these lower and older strata contain bituminous coal, which shows, during the years it has been worked, the following analyses:

		Minimum	Maximum
Sulphur	.. ..	0.15	2.8
Ash	.. ..	0.4	3.—
Moisture	.. ..	4.60	11.20
Fixed Carbon	.. ..	51.—	56.—
Calories	.. ..	6970	7540

On an average 13,000 B.T.U's.

CALORIC VALUE.—The low ash content is remarkable and a cargo shows only unimportant higher percentages as the seams are



Screening Plant, Lao Boeah Pit

very pure and free from layers of shale or slate. The coals are also remarkable for their tar contents. Low temperature distillation gave from 12 to 20 per cent. of tar.

SAMARINDA-COAL AS A BUNKER COAL.—A testimonial from the owners of the *s.s. New Mathilde*, trading between Hongkong and Chinese Coast ports, is that the East-Borneo unscreened Dyak coal: "has given entire satisfaction and the same results as the best 'Ochi' lump coal supplied to the steamer the trip before."

Many Royal Mail Packet Steamers are regularly using this unscreened coal.

SAMARINDA-COAL AS A LOCOMOTIVE COAL.—The Dutch East Indies State Railways have placed the East-Borneo Mahacam coal on their list of first class coals and has signed a five years contract for 100,000 tons yearly.

AS AN INDUSTRIAL COAL.—The Singapore and Hongkong markets are also using increased supplies of this coal, for Electric Power Stations, Brick Works, Oil and Sugar Mills, Cement Factories, until the demand is already exceeding the supply.

This Dyak and Mahacam coal is a bituminous coal of a lustrous black color, similar to that of Northumberland-Durham coal. It is rich in volatile matter with a heating power of 7,200 calories (Mahler Bomb Test) or equal to about 13,000 British Thermal Units. The percentage of ash is strikingly low (3—4 per cent.) and no clinkers are formed in the furnaces. Sulphur and other objectionable matter are almost non-existent.

ANALYSIS.—The following analysis made by the Dutch Government Laboratory for Testing Materials, Department of Public Works, at Bandoeng, Mid-Java, shows the value of the Dyak and Mahacam, Samarinda-coals:

Result of Test of Samarinda coal sample, received on May 6, 1926.

Moisture (coal dried at 105° C.)	7.99%
Ash	4.60%
Caloric value	7210 calories

(equal to) 12,978 Brit. Therm. Units.

(Signed) W. VAN ALPHEN DE VEER,
Chief of Laboratorium.

Bandoeng, May 25, 1926.)

The results show the Samarinda coal to be second to none of the coals mined in the East Indies.

The salient features being:

- 1.—Uniform good quality
- 2.—The very low percentage of ash and clinkers.
- 3.—The high evaporation per lb. of coal.

EXPORT:—Until a few years ago, East-Borneo Coal or Dyak Coal as it is termed was unknown outside Java. When the East-Borneo Company started on its new development and production admitted its export, the pioneer work began to bring the coals to foreign markets, with Singapore, Hongkong, Manila, the Philippines, Saigon and Bangkok as distributing points.

Own Colliers

The Company has established its own colliers. The *s.s. Adriaan Stoop* of 2,500 tons Dead Weight carrying capacity, is the most modern coal carrier in Eastern waters. Built in Rotterdam, according to specifications and plans to adapt her to the special conditions under which she has to operate, this steamer was fitted out with the latest modern appliances and technicalities for self-discharging.

She is fitted out with powerful winches and derricks, automatic grabs, by which she is able to discharge her cargo under all conditions, with or without outside help, in 24 hours, wireless telegraphy, spacious passenger and crew accommodation and equipped for the burning of the company's slack or dust coal.

During the first twelve months this vessel has been in operation, she has maintained a regular speed of over 10 knots on a consumption of slack coal, only 25 per cent. more in relation to ordinary lump coal.

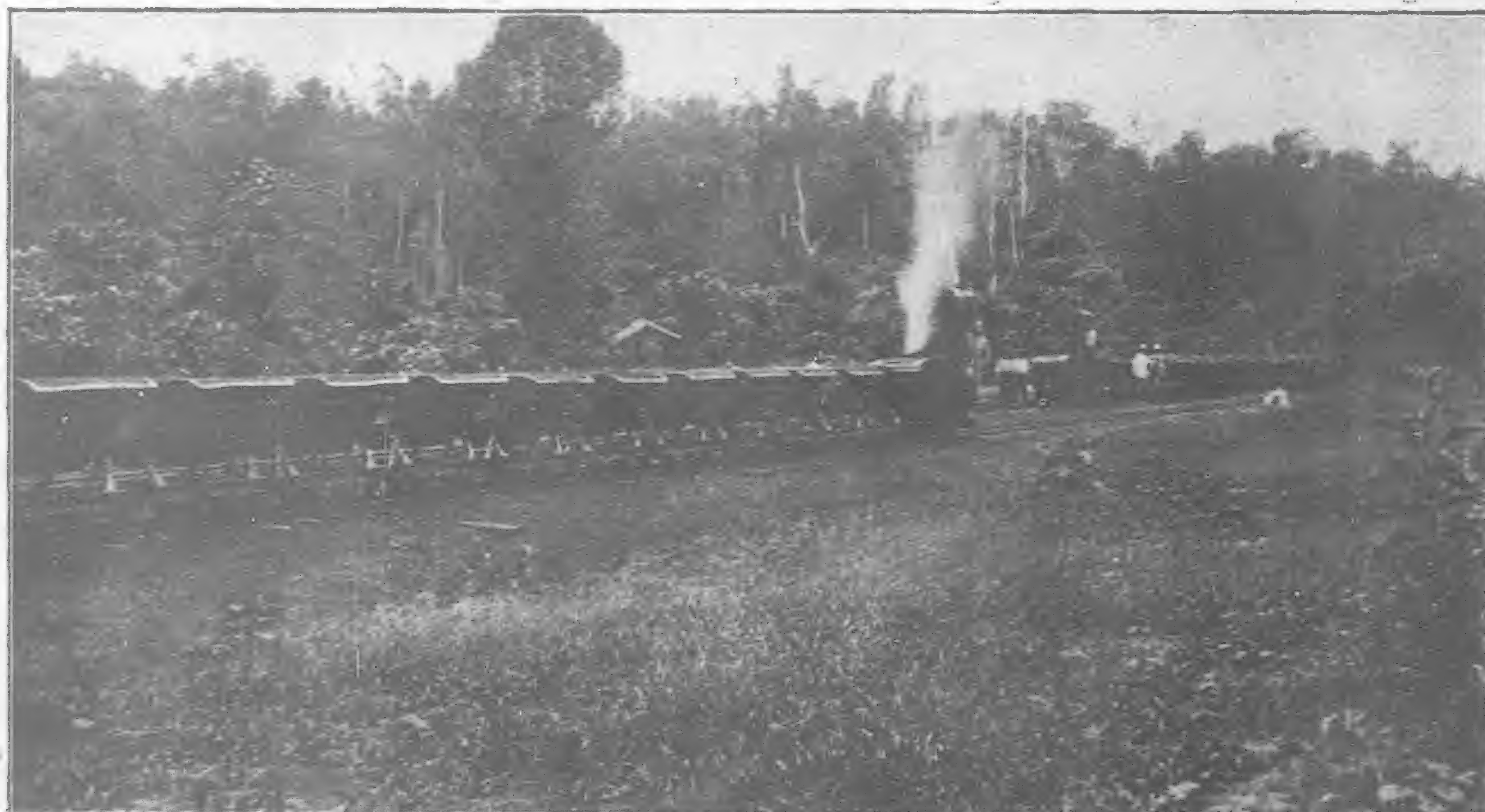
This slack coal has also proved to be excellent fuel for mechanical stokers. Many factories in Singapore have adapted their furnaces for its use.

Exploitation

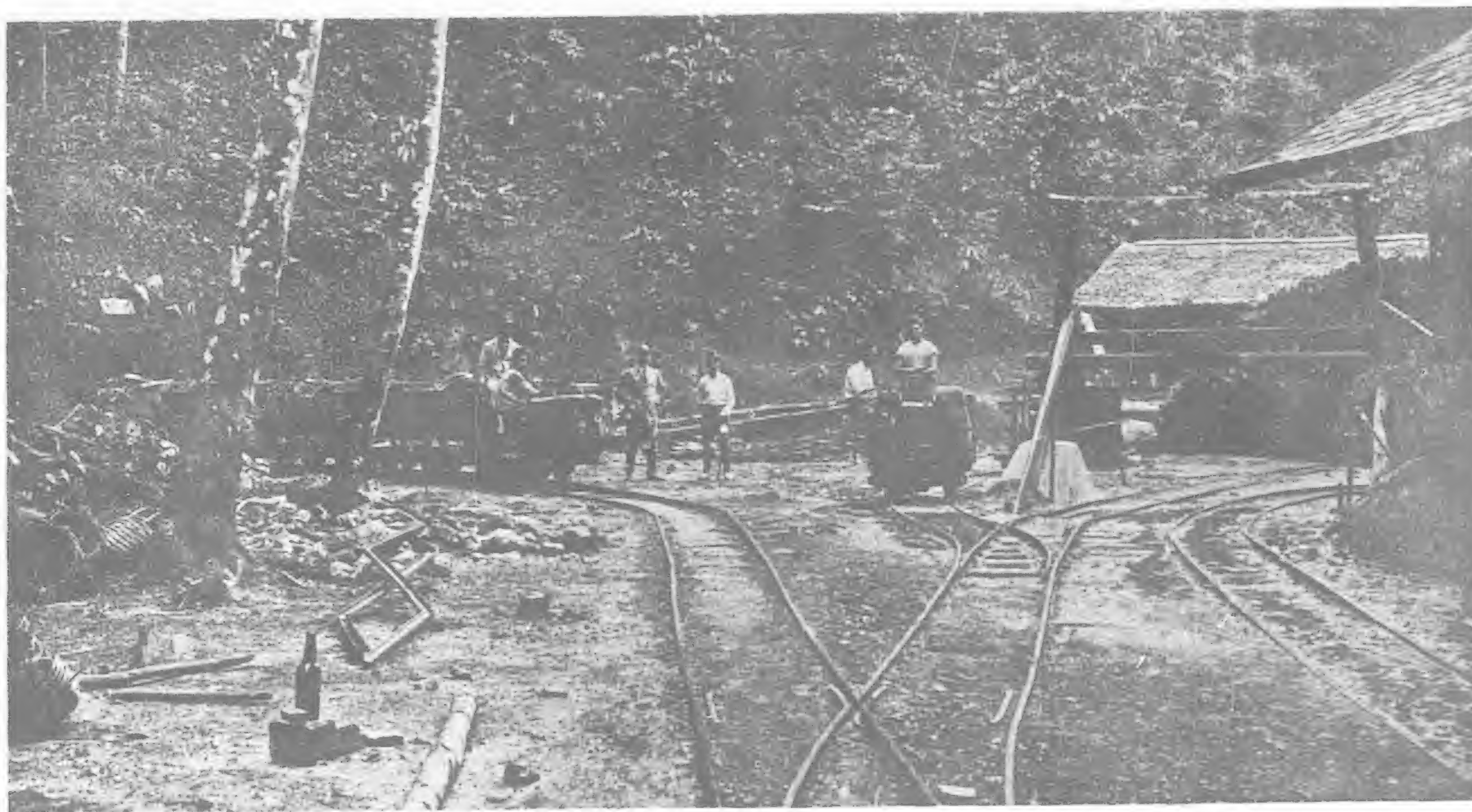
LABOR AND HYGIENIC CONDITIONS.—Outsiders have no idea about the difficulties to be overcome in opening up a mining industry in the heart of the tropical jungle, with no means of access. Not only the huge task of clearing the land must be undertaken,



One of the Many Oil Drilling Towers on the Concessions



Coal Haulage; Shunting Junction Loah Boeah Mine



Pit Entrance and Transport Incline with Electric Haulage

roads built, but also whole villages and towns must be built for housing the laborers and employees, and everything provided for their health, comfort and entertainment.

The native labor at present employed by the East-Borneo Company Collieries consists of: 1,695 contract laborers, principally Javanese and a few hundred Chinese; all imported labor from Java under contract. A further 1,000 laborers are at present being contracted for.

The staff consists of 50 Europeans, civil, mining, electrical engineers, chemists and medical doctor and surgeon.

The sick are nursed in a hospital fitted out with all the modern accessories.

SANITARY AND LABOR CONDITIONS.—The coolies are housed either in barracks or the married ones, in little cottages in very hygienic surroundings. Regular sanitary inspection and supervision

of labor conditions, by the Government occurs every two months.

There is a school, free river transportation, by steam launches to the townships of Samarinda and Tenggarong, and for their entertainment a "movie" and the inseparable so-called "Passar," (market or fair) without which a native cannot be happy.

Bungalows for dwellings of the staff are built on the hills in picturesque and hygienic surroundings.

Despatch

The present despatch in loading steamers is at least 800 tons per day. Bigger and more loading berths are being built to ensure a still quicker despatch to the steamers loading at the collieries. After the improvements afore-mentioned being effected, the despatch will soon be increased to at least 1,000—1,200 tons per day.

Osaka to Build Subway

PREPARATIONS are under way to commence the construction of the subway in Osaka some time in May, next year, says the "Osaka Mainichi." It was to have been started some time during the current fiscal year, but was postponed in consequence of delay in floating loans. It is now expected that the bond issuance will be completed by the end of January, next year.

The construction of the first subway line, connecting Minakata-machi of Higashi-Yodogawa-ku and Abiko of Sumiyoshi-ku will be started at four places, *i.e.*:

1. At the northern side of the Osaka station of the Government Railway, which is now under reconstruction.
2. The distance between Oyebashi and Yodoyabashi.
3. The distance between the southern end of the Yodoyabashi which spans the Tosabori-gawa and Honmachi.
4. The distance between Tennoji and somewhere about Nishida.

Most Difficult Part

Of these four places, the construction work in the neighborhood of the Osaka station is said to be the most difficult. It is understood that the first boring will be made at a point of 700 feet north of the "Hankyu" station to the depth of 55 feet, and the tunnel of the subway be built from this point onward. But this locality has a close connection with the new Osaka station of the

Government Railway. As soon as the subway tube is built, the elevated line of the Government Railway is to be constructed on top of it, and at the same time, the Umeda station of the subway is going to be erected on the western side of the present "Hankyu" Umeda station.

The Umeda station of the subway will have two platforms of 720 feet long and 30 feet wide, and quadruple lines are to be built. This station will have two entrances, one somewhere near the present "Hankyu" station and the other near the exit of the Osaka station of the Government Railway. Furthermore, a general readjustment of the buildings in front of the Osaka station is to be effected, and also the construction of underground passages beneath the new Osaka station. As all of these engineering enterprises are to be started at about the same time, the engineers are likely to have a hard time in readjusting their work with that of other enterprises.

Another difficult point of the proposed subway is that the tube is to run underneath the river-beds of the Dojima-gawa, digging down at the southern end of the Oye-bashi to the northern bank of the river, and also, starting at the northern end of the Yodoyabashi and go underneath the river-bed to the southern bank.

The tube is to run at about 25 feet below the river-beds, and as soon as the tube is installed, the reconstruction of the Oye-bashi and the Yodoya-hashi will be started.

Engineering Notes

ELECTRIC LIGHT, POWER AND TRACTION

NEW AUTOMATIC TELEPHONES FOR FUSHUN.—The automatic telephones installed at the Funshun Post Office will be finished during January next, and the Postal people there are making preparations with help from Dairen and elsewhere for opening the new installation to traffic.

HOKUSEI RAILWAY ELECTRIFICATION.—At a general meeting of shareholders the company approved the plan of increasing its capital by Y.450,000 to Y.800,000 and electrify its line. This is a small railway company located in Kuwana Gun, Miye Prefecture, with a mileage of some 12 miles. The electrification is to be completed before the end of 1930.

HAKUSAN SUIRYOKU K. K.—New Power Station (Hakusan Water Power Co., Ltd.).—The Torigoe Hydro-Electric Power Station, capacity 13,000 k.w., has just been completed. Originally Hakusan Suiyoku intended to secure a power franchise in Fukui Prefecture in order to use power from this plant, but changed its plan to sell the output to Kyoto Dento K.K. at the request of the latter.

A NEW ELECTRIC COMPANY IN KARAFUTO.—A new company known as the Chinnai Denki K.K. (Chinnai Electric Co., Ltd.) has just begun business. This company supplies Mihama Mura, on the west coast of Karafuto, where there are about 1,360 lights (at 10 candle power a unit), or actually 665 lights. Power is generated by an American engine, capacity 40 k.w., 3,300 volts, alternate current. The company has a capitalization of Y.100,000.

NANWA DENKI TETSUDO K.K.—A New Subsidiary of Osaka Tetsudo (Nanwa Electric Railway Co., Ltd.).—Directors of Osaka Tetsudo and business men in Nara Prefecture are promoting a new electric railway to be known by the above name. The project is to construct a new line from Nagao to Gojo Machi via Goshō, Yoshinoguchi, Kita Uchi, distance 11 miles 38 chains. Capital of the new company will be Y.2,000,000. Part of the line, probably from Nagao to Goshō, is to be completed before the end of 1929, the remaining section by the autumn of 1930.

OSAKA MIYATSU KYUKO DENTETSU.—A new railway planned.—Chuji Masuyama, auditor of Osaka Dojima Rice Exchange Company, and directors of Hanshin Denki Tetsudo K.K., Hanshin Kyuko Dentetsu K.K., Keihan Denki Tetsudo K.K., etc., are planning a new electric railway between Osaka and Miyatsu. Miyatsu is located in Tango, Kyoto Prefecture, and the line is to pass Fukuchiyama on the Sanin Line (Govt.) and Kawamori. The new company is to be known as Osaka Miyatsu Kyuko Dentetsu K.K. (Osaka Miyatsu Express Electric Railway Co., Ltd.), to be capitalized at Y.15,000,000. The necessary license is to be applied for in the near future. (Office of promoters is located at Osaka Jitsugyo Kyokai Building, Nagabori Kita Dori, Nishi Ku, Osaka).

The projected line is to start from Sangoku (or Mikuni) on the Hanshin Kyuko Line and to terminate at Miyatsu in Kyoto Prefecture, via Ikeda Machi, in Toyono Gun, Osaka Pref., Fukuzumi Mura, Kumokusayama Mura, in Taki Gun, Hyogo Pref., Otobara Mura, Hosomi Mura, in Tenda Gun, Kyoto Pref., Ishiwara Station on the Sanin Line (Government Railway), Saga Mura, Obata Mura, in Iruka Gun and Kato Mura and Kawamori Machi in Kasa Gun, Kyoto Pref. The gauge will be 4-ft. 8½-in. Total mileage 67 miles. Time required to cover the distance is estimated at about two hours, which is shorter than by the government railway.

THE SECOND FUJI ELECTRIC POWER CO., LTD.—A sister company of Fuji Denryoku K.K.—known by the above name—has just been established in Japan.

NEW TRAM LINE IN SEOUL.—The tramway between Nandaimon and Kōshidō, 2,774 metres in length has been completed. Rails of 75 pounds are laid and the cost of construction amounting to about Y.300,000.

It is understood the Seoul Electric Company has placed an order with the Tanaka Works for five bogies to be run on the new section, but as these will not be completed before January next, eight to 15 cars will be transferred from other lines to be used for the present.

HYDRO ELECTRIC SCHEME FOR HONAN.—The Pei-Yung-Tan waterfall in Hweishien, in northern Honan, will be harnessed to generate 2,600 horse power of energy for the manufacturing of electricity in pursuance to a recent order from General Feng Yu-hsiang. Mr. Teng Chieh-hsi, acting chairman of the Honan provincial government, dispatched an expert to the scene to study the prospects of installing a large generator there. The installation when completed will be expected to produce enough electric current to light 30,000 lamps.

ELECTRIC RAILWAY IN DIAMOND MOUNTAIN.—Mr. Kume, President of the Kongosan Electric Railway Company, recently stated that extension of the railway from Shōdō was progressing steadily, and if the present rate was kept up, would be completed as far as Mikiri the year after next. Arrangements had been made to extend that line still further to Chōauji, another five miles. The Company has laid down a plan to construct an electric railway from Shinhori to Onseiri, and then to Kyuryuen, and survey would be started next year. The projected railway would be 26 miles in length, and the cost of construction would amount to Y.200,000 to Y.300,000 per mile.

NEW ELECTRIC LINES NEAR OSAKA.—The existing electric trolley lines in Osaka and vicinity are maintained mostly by such large companies as the Shin Keihan Trolley, the Keihan Trolley, the Osaka Rapid Transit, the Hanwa Trolley, the Osaka Trolley, the Osaka Railway and others, each capitalized at more than Y.20,000,000.

The railway and trolley lines applied for have a total projected mileage of 614 with a total capitalization of Y.340,429.00, including 534 miles of railways with capitalization of Y.305,250,000 and 80 miles of trolleys with a capitalization of Y.35,179,400.

The Ministry of Railways now has 480 applications for the construction of new trolley or railway lines in all parts of this country. Of these, 50 per cent. are filed by Tokyo and Osaka. Tokyo has 28 lines of 540 miles in operation and new applications for 125 lines of 1,725 miles.

The Ministry is closely investigating the real necessity of constructing such a large number of lines in Tokyo and Osaka. While new applications in Osaka mainly consist of the extension of the existing lines, those in Tokyo are almost entirely new lines.

INDUSTRIAL

MITSUI BUSSAN AND AMERICAN CORN PRODUCTS COMPANY.—It is reported that the American Corn Products Company is planning to construct mills in Japan in co-operation with Mitsui Bussan K.K. which controls the Japan Flour Milling Co., Ltd. According to these reports a new company is being formed, with an initial capitalization of Y.10,000,000.

NEW SUGAR CENTRAL MILL IN NAGA.—The first attempt to produce sugar on a large scale in the Bicol regions will be initiated with the formation of a sugar central in Naga. Camarines Sur, by the Bicolandia Sugar Company capitalized at one million pesos.

The new company has acquired rights to a large tract of land in these two sections. Planting, will be begun early next year and the machinery for the central will be ready for the next milling season.

ARTIFICIAL FERTILISERS IN JAPAN.—Japanese enterprises for the extraction of nitrogen from the air for the purpose of manufacturing fertilisers are said to be making good progress. According to the Government plan for control of these fertilisers, official agencies are to fix the maximum price and buy or import fertilisers when such action is deemed necessary. The Japan Nitrogen Fertilisers Co. is erecting an immense plant in North Korea. The Japan Artificial Co. is to complete its Toyama factory next.

ELECTRO-CHEMICAL INDUSTRY CO., LTD. EXTENSION OF OMUTA MILL.—This company plans to increase its present capacity of 50,000 tons of sulphate of ammonia and calcium nitrogen to 100,000 tons. Power is received from Oyodogawa No. 1 Power Station and Kumamoto Denki K.K., but when Oyodogawa No. 2 Station (to be completed in 1929) is put in operation, power purchase from Kumamoto will be stopped, to be replaced by Oyodogawa power. The cost of construction is estimated at Y.15,000,000, including power transmission line between Yatsushiro and Omuta.

ORIENTAL MOUSSELAINE CO., LTD.—This company is planning to establish a new company to take over the Kamine Mill, in Saitama Prefecture, with an initial capital of Y.1,000,000 (of which Y.250,000 is to be paid in). This new subsidiary is to manufacture woollen tops and a combing set is being installed. The productive capacity of this combing set is rated at 90,000 pounds a month. The woollen tops are to be sent to the Kameido Mill of the Toyo Mosurin to be manufactured into woollen yarn. The motive of this plan is to secure an independent supply of yarn.

PHILIPPINE GOVERNMENT ASKED TO MAKE NITROGEN FERTILIZERS.—Members of the Philippine Sugar Association at their recent convention passed a resolution to urge the legislature to make an appropriation for the investigation of the possibility of producing nitrogen from the atmosphere by hydro-electric power in the Philippines. It is believed that this request will be favorably considered by the government as such development is in line with the existing program for the development of industry in the islands. Large amounts of nitrogen fertilizers are imported yearly. Through the production of synthetic fertilizers a considerable saving would be made.

MITSUBISHI OWN REFINERY.—The Mitsubishi Shoji Kaisha which is now supplying crude and heavy oil to Japan oil companies by importing it from foreign countries has decided to carry on a refining enterprise of its own. The company has contracted to buy a large tract of land covering 33,000 tsubo at the Tsurumi for this object, reclaimed land from the Tokyo Bay Reclamation Company, according to the "Tokyo Asahi Shimbun."

The capitalization of the proposed enterprise will be about Y.10,000,000. The increasing demand for gasoline and lamp oil in Japan in recent years has caused the company to determine to embark on the enterprise.

ARSENAL CONVERTED INTO IRON WORKS.—The Reconstruction Department of Kiangsi has transformed the Kiangsi Arsenal into an iron works.

OJI PAPER MANUFACTURING CO. PLANS IMPROVEMENTS OF MILLS.—This company has large extension plans and improvement plans, the most important of these being the installation of one big set of paper making machines at its Tomakomai Mill, in the Hokkaido. It is reported that some boilers in this mill require urgent replacement, being installed as early as 1910. The efficiency of old boilers in this mill is gradually deteriorating and they have to be replaced before a few years to come. The company is also planning extensions and improvements at its Kokura Mill, in Kyushu, where an electric generator of 2,500 k.w. is to be installed.

STORAGE BONDED WAREHOUSE PLAN FOR YOKOHAMA.—With a view to establishing a bonded cold storage in Yokohama following those of Kobe and Osaka, a promoter group has applied to the Customs Authorities of Yokohama for lease of a building site covering 400 tsubo in the customs compound.

The company will have a capitalization of Y.200,000 with 10,000 shares each Y.20 in face value. A re-inforced concrete building will be constructed at a cost of Y.111,000. The company will also handle, it is reported, sale on consignment of those merchandises submitted and finance thereof, ice manufacturing and its distribution.

Among those commodities handled in a year through the Yokohama Customs that which need refrigerator are 4,500,000 piculs of beef, vegetables, eggs, cow hides, sheep skins, must be kept in the cooler reaches 1,300,000 litres.

JAPANESE ELECTRIC WIRE MAKERS EXTEND EQUIPMENT.—Japanese Manufacturers of electric wire and cable are getting busy, due to constructions and improvements of power transmission systems and the development of electrification in various fields, and their production has been steadily increasing. At the same time makers are achieving great improvements in engineering technics, as evidenced by the completion of 66,000 v. cable by Furukawa Denso and 154,000 v. overhead line manufactured by Sumitomo under using foreign patents. Hitachi Seisakujo is also planning extensions to manufacture covered wire, while Fujikura Densen has plans to instal a 1,000 h.p. millmotor in order to increase the capacity of its Fukagawa Mill, Tokyo.

COLD STORAGE WORKS AT KEPPEL HARBOR.—At the new works of the Fresh Food and Refrigerating Co. the ice is made by two 180 horse-power engines of the Merrless, Bickerton and Day type, capable of manufacturing 80 tons of ice per day. The supply is divided into two sections, 50 tons being made in ice tanks in a specially provided room for the purpose of retail sale, and 30 tons kept to retain the desired temperature of the cold rooms.

In the ice manufacturing department, where the actual blocks of ice could be seen, there were dozens of zinc tanks, all of a capacity of 300 lb. Three tanks are in rows of five, and immediately one row is ready, a small electric crane lifts it away, to a place where it is automatically thawed sufficiently enough to remove the blocks from the tanks. Thus, in the space of a few minutes, fourteen 300 lb. blocks are ready for disposal. The most up-to-date methods of hygiene are employed, and care is taken that the ice is not touched by human hand from start to finish. All the machinery is in duplicate, including the generating plant, by means of which the company makes its own electrical power.

The works were designed by Mr. G. L. D. James, who has installed similar institutions in a number of places in various parts of the world, while the installation was under the charge of Mr. B. C. Goudie. Mr. A. R. W. Butcher is managing-director of the new company, and Mr. J. Rafferty, works manager.

NEW BREWERY, SINGAPORE.—Last year Malaya imported ale and beer to the value of \$2,200,814, and porter and stout to the value of \$2,134,595. It is hoped that a substantial portion of this trade may be secured by Singapore Brewery, Ltd., a new company recently floated. The nominal capital of the company is \$750,000, in \$1 shares, and 450,000 shares were issued. Larger beer, English ale and stout are to be brewed. The plant contemplated would be capable of an output of 40,000 cases a year.

PHILIPPINE MILLS EXPANDING EQUIPMENT.—Three of the largest centrals in the islands are adding extensive improvements in order to increase their daily capacities to 3,500 or 4,500 tons of cane. The Binalbagan central will then be the largest mill on the island of Negros. The milling plant is a tandem 19-roller mill electrically driven. There are two centrals in the islands with electric mill drive.

Extensions in the Del Carmen plant will increase the capacity to 4,000 tons of cane daily. The Calamba mill is installing a tandem crushing plant with crusher and five three-roller mills. With this additional crushing machinery it is believed that the extraction will be much improved.

MITSUBISHI WILL ESTABLISH OIL REFINING COMPANY.—The Mitsubishi Trading Company has formed a new company to manufacture gasoline and other refined oils, with a capital of Y.10,000,000. The present oil department of the company is to be taken over by the new concern. A factory site has been purchased from the Tokyo Bay Reclaimed Land Company covering 33,000 tsubo near Tsurumi, Yokohama. The construction of the plant will be started about March next year.

The oil supply will be obtained from the Associated Oil interests which the Mitsubishi represents in Japan. Those oil tankers belonging to the company will be employed in the transportation of the crude and heavy oil across the Pacific.

TO CONSTRUCT MANY FISH CANNERIES.—The Central Concessions Committee, has agreed to and signed 22 contracts, approved by the Soviet Government for the purpose of erecting fish canning factories in Kamchatka.

Of these, 19 were concluded with the Nichiro Gyogyo Kabushiki Kaisha, a Japanese firm. Each contract provides for the establishment of a factory employing from 100 to 600 persons.

From each box of canned fish, the Soviet Government will get a certain amount as royalty, this amount being fixed in the contract. In addition, a certain rent has to be paid for the right of using certain fishing allotments. The amount for this is determined after a public auction of these allotments. It is calculated that the rents will net the Soviet Government over 600,000 roubles a year.

Concessionaries have to conform strictly to all existing laws and regulations in the USSR and all the contracts are for a period of ten years, up to December 1, 1938.

RAILWAYS

TRAMS AT MUKDEN.—Mayor Li Teh-sin of Mukden, holding ex-officio the Superintendency of the International Settlement Office, is planning to build a tramway to facilitate communications between the International Settlement and the South and North market places, Mukden. This new proposition will cost \$700,000.

TO BUILD LIUYUANKO-KAIFENG LIGHT RAILWAY.—In order to utilize the famine labor and to facilitate means of communications, the Bureau of River Works of Honan province has recently projected plans to build a light railway, connecting Liuyuanko, on the southern bank of the Yellow River, and Kaifeng. Work will commence as soon as appropriations are made.

NEW MUKDEN-FAKUMEN RAILWAY.—The Chinese proposition to lay a railway between Mukden and Fakumen is taking shape, and the work is expected to be finished by May next. No foreign capital will be accepted.

THE LINAN-KOCHIU RAILWAY, YUNNAN PROVINCE, COMPLETED.—The Linan-Pisehchai portion of the Linan-Kochiu Railway, Yunnan Province, under construction of the Pisehchai-Kochiu-Linan Railway Company, has been completed, the Kochiu-Pisehchai portion having been open to traffic for some years. A direct service from Linan to Kochiu commenced on November 22.

NEW EXTENSION OF TAONAN-ANGANGCHI LINE.—The work connected with the intersection of the C.E. Railway track by the new extension of the Taonan-Angangchi Line north to Tsitsihar has been completed. From December 14, provisional traffic was to be opened right up to Tsitsihar. While the through traffic arrangements are still under negotiation, the Chinese city of Tsitsihar is now made accessible by railway on the new Taonan-Tsitsihar Line, of which the Taonan-Angangchi section has formed part.

KOTO RAILWAY.—Tadaichi Matsuda, of Nishinomiya City, in Hyogo Prefecture, and others are promoting a new railway company, to be known as Koto Tetsudo K.K. (Lake East Railway Co., Ltd.) and has applied for the necessary license. The plan is to construct an electric railway from Yawata Mura, Kanzaki Gun, Shiga Prefecture—in front of Notogawa Station on the government line—to Yokaichi near the Third Air Regiment. The distance is 5 miles 45 chains. Capital will be Y.400,000 (8,000 shares, Y.50 face value). Head office: Minami Gokasho Mura, Kanzaki Gun, Shiga Prefecture.

PUBLIC WORKS

HUAI RIVER AND GRAND CANAL CONSERVANCY PROJECT.—An elaborate project for the conservancy of the Huai River and the Grand Canal, which form the main waterways of Kiangsu province, has been submitted by the Kiangsu Provincial Government to the State Council for approval. The project advocates digging branch canals as feeders to the Huai River and dredging for the Grand Canal. The cost of the Huai River scheme is estimated at \$50,000,000, of which \$34,000,000 for widening the Huai River shall be provided by the Central Treasury, and \$16,000,000 for digging various small canals by the Kiangsu Provincial Treasury. The total construction expenses of the Grand Canal is estimated at approximately \$24,000,000, to be shared equally by the Central and the Kiangsu Provincial Treasuries. It is also urged that in view of the multifarious traffic in its waters, work on the Grand Canal conservancy should be started as soon as possible and before that on the Huai River.

LARGE BRIDGES IN INDIA.—During the heavy floods on the Malabar Coast, S. India, in 1924, the Old Kuttupoya Bridge was demolished. The whole hillside slipped in front of the bridge and when the water level rose to a height capable of over-topping this obstruction, it fell upon the bridge below and deposited an avalanche of floating trees and debris.

The new bridge, which is said to be the largest single span in reinforced concrete in India (120 feet) is located on rocks about a furlong above the hill slide. It is considered likely that the new approach road through the hill slide may not have completely stopped slipping, and Aranco culverts were chosen for this road as they can be readily taken up and reinstalled without suffering in any way should another slip occur. Shown in the accompanying photographs are the new bridge while yet under construction and one of the culverts installed in the approach road. The new bridge and roadway have a width of 14 feet.

MACAO WHARF.—Work has been completed on the first wharf to be built in the new port of Macao. This work which has cost about \$120,000 is an excellent piece of engineering, and when the shore approaches are finished this pier will be much in demand by vessels making use of the port.

From the wharf a fine bund road passes along the port reclamations, running southwards to connect with Praia Grande and thence to the present business center of the town, and northwards past the newly-projected Naval Yard and farther along to the Race Course and then through the Barrier Gate into Chinese territory.

SHIPPING DEVELOPMENTS AT CANTON.—Shipbuilding and dock facilities have been improved by Rear-Admiral Chen Chieh, commander of the South China naval fleet, under the direction of Generals Li Chi-sen and Chen Ming-shu. The Kwangnan dock and engineering works repaired altogether 66 war vessels last year, including three war vessels of the Kwangsi province.

It is the plan of the Canton authorities to build two more docks at the port of Kiungchow for shipbuilding and repairs. The first dock will be 16-ft. deep, 35-ft. wide and 330-ft. long.

The second dock will be 12-ft. deep, 35-ft. wide and 221-ft. long. In addition to the present workmen and technical staff 100 students will be taken for four years training in shipbuilding, and 60 students will be accepted for shipping and ocean navigation. One large and one small naval ship will be built at the old Kwangnan Docks and if they are successful more shipbuilding will be undertaken by the Canton Government.

ILOILO WHARF CONTRACT.—The contracts for the construction of the Iloilo Wharf was recently awarded by the department of commerce and communications to Tan C. Tee and Company. Manila Chinese building contractors. The wharf will form a part of the Iloilo harbor improvement for which there has been sold bonds in the United States to the amount of \$4,500,000.

The award was made after months of intensive study on the part of the officials of the department of commerce among eight others who submitted bids ranging from P.1,500,000 to approximately P.3,000,000. The firm of Tan C. Tee and Company underbid the rest by offering to do the entire work for P.1,476,354 which is P.144,791 lower than the next lowest bid submitted by M. N. Cacho, engineering and building contractor of Iloilo.

In addition to being the lowest bidder, the Chinese engineering firm, offers to complete the project in 550 days, the shortest time among the bids.

SINGAPORE CONTRACT.—An American company has been selected to supply a particular type of excavating machine required by Sir John Jackson, Ltd., who hold the contract for the construction of the Singapore naval base. The order amounts, it is understood, to £70,000 for four machines, an amount which would, it is pointed out in a protest to the "Daily Express," if expended in England, have provided work for 600 men for four months.

Mr. Westacott, managing director of Sir John Jackson, Ltd., in an interview with the "Daily Express," said:—"It is quite true that we have placed an order for four excavating machines of a particular type with the Bucyrus Co., of America. We have, however, ordered five other smaller machines from the two British companies—three from one, two from the other—which make the same kind of machine as the Bucyrus Co.'s product. These two British companies have only recently started work on the American lines, and, while we were satisfied to order the smaller machines from them, we preferred the design of the larger American machine—and we banked on American experience. There is no obligation on us to ask British firms to make us tenders for anything. Our competitors for the contract were not confined to Great Britain for their requirements. Why should we have been? It is our object to get the work done as well, as cheaply, and as quickly as possible."

An official at the Admiralty remarked that the question of sub-letting part of the contract was entirely one for Sir John Jackson, Ltd., to decide.

PNOMPENH'S NEW BRIDGE.—At Pnompenh, the Résident Supérieur and the King inaugurated the great bridge over the Bassac river, constructed by M. Levallois Perret.

AVIATION

JAPAN-CHOSEN-MANCHURIA AIR PASSENGER SERVICE.—Relative to the Japan-Chosen-Manchuria air passenger service from Tokyo to Dairen, the sanction for inaugurating it in Chosen has been obtained from the Government-General of Chosen. The route in the Peninsula runs through Urusan, Taiko, Seoul, Pingyang and New Wiju.

BRITISH ENGINES IN JAVA.—The new Dutch East Indies air line, the Nederlandsch Indische Luchtvaart Maatschappij, is using Armstrong Siddeley Lynx engines of 230 h.p. as the power units for their Fokker aircraft.

There are four machines, and each is fitted with three Armstrong Siddeley Lynx engines developing 230 h.p. at 2,090 revolutions. This gives a total horsepower of 690, and ensures practical immunity from forced landings. It was with the same type of machine and engine that Lieut. Koppen made his record flight of 18,000 miles from Holland to the Dutch East Indies and back, and it is the Lynx engine which is the power unit in the Blackburn Lincock, a single-seater fighter which has a surprisingly high performance and one which in many respects can compare with the fighting aircraft of many foreign nations, although it has practically half the horsepower normally available.

TELEPHONE, TELEGRAPH AND WIRELESS

THE HANKOW-PEIPING LONG-DISTANCE TELEPHONE SERVICE.—Work on the Hankow-Peiping long-distance telephone line is to be divided into three sections, to be successively carried out, namely, (1) From Singyang to Changteh, (2) From Hankow to Singyang, and (3) From Changteh to Peiping. The bid for the construction of the first section was accepted at \$100,000 and work will commence shortly.

PHOTO-TELEGRAPHY IN JAPAN.—It is reported from Berlin by the "Daily Mail" that Messrs. Siemens & Halske, the German electrical firm, have erected machines for picture telegraphy at three Japanese cities for the "Asahi" newspaper and the Nippon-Dempo News Agency. The picture service between Osaka and Tokio and between Tokio and Kioto has begun, and others opened on the day of the Japanese Emperor's coronation.

TO INSTAL WIRELESS STATION IN NINGPO.—Ministry in Nanking has recently divided the country into four wireless districts: namely, the north-east, the north-west, the south-east, and the south-west. Ningpo, Chekiang province, being an important city in the south-eastern district, is to have a wireless station first. Engineers and radio apparatus have already been despatched to the city for installation.

AUTOMATIC TELEPHONE EXCHANGE FOR TIENTSIN.—Almost all the languages of the world are spoken at Tientsin, and both the English and the Chinese are pronounced differently by all the other nations. This naturally has led to endless trouble and misunderstandings in the telephone service of that city. For this reason it was decided to introduce the automatic system, which here proves to be of particular advantage. Out of a total of 10,000 telephone subscribers at Tientsin 1,000 were connected to the automatic system on October 1, and 5,000 more have followed on December 1. The whole plant was supplied by the Siemens & Halske Company, and German engineers are supervising the installation. It is proposed also to install the automatic telephone system at Tsinan and Tsingtao.

LARGEST WIRELESS PLANT IN THE ORIENT.—The *Asahi* reports that the construction of the wireless transmission station, which was being erected at Isami-mura in Aichi Prefecture since January last year, has almost been completed. The plant is equipped with a high frequency current dynamo of 860 kilowatts and antenna towers, each measuring 820-ft. high, the entire installation costing the authorities six million yen in round figures. It will be the largest plant in the Orient, and will be ready for service in January, next year.

CONCRETE FOR CANTON.—It is learned that the Automatic Telephone Office has decided to use reinforced concrete posts to carry the overhead conductors for their service, as being best from all points of view. The present telephone wires are carried on wooden posts, which continually required changing and renewal.

The China Electric Company, which concern is installing the automatic telephone service, has concluded contracts with two other companies for the manufacture of 550 posts within two months' time. The posts will be of four different lengths, 25, 30, 35 and 40 feet, and the work will be supervised by special experts from the China Electric Company.

These carrier posts will be erected on such of the city roads where it is considered undesirable to run the conductors in underground trenches. Along the main roads in the city the lines will be placed underground in special conduits.

INCREASE OF TELEPHONE TRUNK LINES PLANNED IN JAPAN.—The Communications Office, which recently completed the establishment of the telephone lines between Tokyo and Kobe, plans to extend the trunk line all over this country with the investment of Y.100,000,000.

In the southern districts, the telephone line is to be extended from Kobe to Okayama, thence to Hiroshima and Fukuoka across the Kanmon Channel, then to Kumamoto and Nagasaki. Of these projected lines, that between Kobe and Okayama, and that between Moji and Fukuoka, are to be completed some time during the fiscal year of 1929-30.

In the northern districts, the telephone line will be extended from Tokyo to Utsunomiya, thence to Aomori via Sendai, then to Hakodate across the Tsugaru Strait, and then to Otaru, Sapporo, and Asahigawa. In addition, such side lines as those connecting Tokyo and Matsumoto via Kofu, Nagoya and Toyama, via Gifu, Fukui, and Kanazawa, Kyoto and Fukuchiyama, Osaka and Tanabe via Wakayama, and Okayama and Takamatsu, etc., are also projected.

With the completion of these lines, it is expected that the telephone system in Japan will be safeguarded from the disturbance by stormy weather and heavy snow.

LONG DISTANCE PHONE FOR P.I.—With the approval by the Philippine senate of the franchise for the proposed Philippine Long Distance Telephone Company and the anticipated approval of it this week by the house, a long distance telephone service between Manila and Baguio will be established within 12 months. The telephone franchise specified that the company shall, if it accepts the franchise, immediately proceed upon the construction of the Manila-Baguio line so that within a year after its approval and acceptance, the company shall have constructed it, or within two years at least. Failure to do this will result in the forfeiture by the company of its right to construct the proposed line unless it can put up good reasons for its delay.

The franchise is to run for a period of 30 years instead of 50 as was originally proposed, after which time, the government shall have the right to take over and operate the system. Although the lines and routes which the company have a right to establish have been specified in the franchise, the franchise virtually covers the entire archipelago as there is no prohibition for the company's petitioning the public service commission to establish such lines as may be needed or justified with reference to public need.

\$600,000 FOR HUPEH LONG DISTANCE TELEPHONE SERVICE.—The Hupeh Provincial Government has approved appropriations totaling \$600,000 for the construction of long distance telephone lines in the Hupeh Province and along with the appropriations approved contracts for telephone materials that have been entered by Mr. H. O. Kung, the Chief Electrical Engineer of the Reconstruction Dept., Hupeh Government with four supply companies at Shanghai.

The largest item was G.\$205,511.52 for 840,000 pounds of No. 12 hard drawn copper wire, 40,000 pounds of No. 10 galvanized iron wire and 160,000 pieces of porcelain insulators and swan neck brackets. The Siemens China Co. was the lowest bidder and obtained the contract.

The contract for the purchasing of a 50-line magneto switchboard, 14 10-line switchboard and 37 cut-in stations was given to the China Electric Co., Shanghai for a sum of G.\$5,619.90.

The Ekman Foreign Agencies, Shanghai, obtained a contract for 20 high priced and 60 low priced 5-bar magnet long distance telephones for a sum of G.\$1,991.20.

The contract for dry cells and wiring materials was awarded to the Kellogg Switchboard & Supply Co., Shanghai for a sum of G.\$1,091.50.

MOTOR CARS

NEW THORNYCROFT MOTOR BUSES IN CANTON.—An order has been placed through Mr. R. R. Roxburgh by the Canton Municipal Government for ten new motor-buses with Messrs. John I. Thornycroft. These are the latest type Thornycroft 24-seater motor-buses. It is believed that some of these are already in Hongkong and will be brought up here in a few days whilst the remainder are already on the way out from Home. The petrol-driven tramcars are also expected shortly, the rails have now been completely laid from the Tai Ping Maloo to the terminus of the Canton-Kowloon Railway at the station at Tai Sha Tau.

KOWLOON MOTOR 'BUS COMPANY.—Fourteen big motor buses from the Thornycroft Factory in England have arrived for the Kowloon Motor Bus Co. Contracts have been confirmed and the bodies are being built by Messrs. Man Wing Tai of Mongkok.

The style will be the same as those which came from England but they will be longer and broader. There are 35 seats altogether and the carriages are the largest in the Colony. Three of them will be completed in a day or two and they will be put on the road after being examined by the Commissioner of Police. The other eleven will be completed during the current year.

MOTOR-CARS IN SOUTH CHINA.—A feature of trade in Hongkong during the last few months has been the rapid increase in the number of motor-cars sent into South China. A local importing firm in a recent month sent 150 cars of one make into the interior. They were mass-production vehicles, costing in the local currency of Hongkong the equivalent of about £150 each, and had powerful engines, as is essential for the rough roads of the provinces of Kwangsi and Kwangtung.

SHIPPING AND SHIPBUILDING

NEW SUBMARINE LAUNCHED.—The submarine 1-62 or large type, was built at the Mitsubishi Dockyard at Wadanorisaki, Kobe. The submarine is of 1,650 tons, with a length of 97.7 meters, and is equipped with six torpedo tubes. The ship will be attached to the second submarine flotilla.

14 MOTOR FISHING BOATS.—The Kwantung Fishery Union has secured a low interest loan of Y.135,000 from the Postal Life Insurance Bureau of the Communications Ministry to build 14 motor fishing boats of 40 ton class. Four of them are already finished, one of which has been sent to Port Arthur and is operating, the other three being employed at Rokotan. The remaining ten will be also ready shortly.

A MARINE INSTALLATION FOR AN INDIAN STATE RAILWAY.—The Marine Superintendent's Department of the Eastern Bengal Railway has recently placed an order for a 28-36 h.p. six-cylinder Ailsa Craig Marine Motor with which equipment a 20 by 17-in. three-blade propeller will be provided. It has been stipulated that the engine is to operate on paraffin fuel.

DOLLAR LINE TO ENTER P.I. SHIPPING TRADE.—The Dollar Steamship Company announced plans to establish an extensive inter-island line in the Philippines.

The company has prepared designs for two passenger steamers which will cost approximately \$3,000,000 each. They will have a speed of 16 knots and will be 350 feet long. They will be built in the United States at an indefinite date.

They will ply between eleven islands of the archipelago, providing feeder service to the two Dollar trans-Pacific lines.

R. S. Dollar, vice president of the company, predicted a tremendous development in the Philippines in the next few years, saying that agriculture, industry and business would enter a new era with the establishment of proper transportation facilities.

MACHINERY

MACHINERY IMPORT TRADE OF SHANGHAI.—Imports of all classes of machinery into Shanghai during the first six months of 1928 were valued roughly at 3,700,000 haikwan taels, as compared with 5,100,000 for the corresponding period of 1927. The principal industrial machinery items entering into this trade, with the percentage attributed to the United States, were as follows: Gas engines, boilers, and turbines, 447,000 taels (24 per cent.); pumps and pumping machinery 200,000 taels (15 per cent.); spinning machinery 880,000 taels (5 per cent.); weaving machinery 297,000 taels (24 per cent.); cigar and cigarette machinery, 418,400 taels (81 per cent.).

LINK-BELT S. C. DRIVES.—Link-Belt Company's new Silent Chain drives from Stock book, just published for their trade, evidences the soundness of an idea advanced by that organization some four years ago, when they inaugurated the plan of furnishing silent chain drives from stock. At that time they announced that silent chain drives of $\frac{1}{2}$ to 10 h.p. would be available from stock, as a joint result of standardization and quantity production.

Heretofore, for more than twenty years, the installation of silent chain drives had been strictly an engineering problem. By their plan, they proposed to so simplify the ordering of drives, through the provision of carefully arranged tables, etc., that their customers would be enabled to order direct from stock. In 1926 the range of horse-powers was increased to 15 h.p.

Now, two years later, and only four years after the idea gained its first impetus, the demand for drives from stock has made it necessary to increase the range to 60 h.p. According to their latest silent chain publication, Book No. 725, it will be possible to obtain drives as high as 60 h.p., in practically any reduction from 1 to 1 to 7 to 1, for immediate delivery, by distributors in the principal cities of the United States.

The "drives from stock" plan does not, of course, in any way affect the range of horse-powers available in the silent chain engineering drives which this company furnishes to industry in general, in drives up to 1,000 h.p. and over.

Link-Belt Company's production of silent chain drives is entirely concentrated in one plant—the Dodge Works, at 515 N. Holmes Ave., Indianapolis, of which James S. Watson is manager.

ROADS

ROADS.—Japan will build more than 3,600 miles of national highways during the next ten years, according to the plan just completed by the Home Ministry in accordance with the decision reached at the recent Cabinet meeting which approved the inclusion in the budget of an appropriation of Y.6,500,000 as the first annual instalment for the road construction programme.

This constitutes one of the so-called positive policies of the Tanaka Cabinet, which aims at the industrialization of the Japanese Empire and as a means of which the Government intends to construct thousands of miles of State and Prefectural highways which will permit of running motor vehicles and which will bind the rural areas where various commodities are produced with cities, ports or railway stations where products are consumed or exported, thus effectively shortening the distances between the producing and consuming centres, and greatly reducing the freight rates on numerous commodities as a result of better facilities in the transportation.

The total sum to be disbursed in the next decade for the construction of the highways will amount to Y.180,000,000, of which Y.62,430,000 will be defrayed from the National Treasury, while the balance will fall on the local governments.

RIVERS, HARBOR, IRRIGATION

PROJECTED WORK BY SHOWA IRRIGATION GUILD, KOREA.—Investigation by Mr. Sawara, expert of the Land Improvement Section in the Government-General, having been completed, arrangements have been made by the Showa Irrigation Guild in South Heian to start work within this year, subject to approval by its members. The total area of land to be irrigated by the Guild is twenty-one thousand *chobu* covering Anshu, Kaisen, and other districts, and it is planned to construct a reservoir with a capacity of 34,000,000 cubic feet in Anshu and Kaisen Districts at the estimated cost of Y.17,000,000, of which one-third is to be defrayed by the Government-General. The work will probably be undertaken by the O. D. Company for the Guild and will require four or five years to complete, this being the greatest irrigation work ever contemplated in Chosen. It is claimed that on completion the yield of rice in the area will be increased from 1 *koku* 4 to per *tan* (over 300,000 *koku* in all), to 3 *koku* per *tan* (600,000 *koku* in all).

DECCAN IRRIGATION SCHEME.—The largest dam in the world was opened on October 27, at Bhatgar near Poona, India, by Sir Leslie Wilson, Governor of Bombay. The dam, which ensures a perennial water supply to a large irrigation tract in the Nira Canal system, has been constructed at a cost of £1,250,000. The lake, which is seventeen miles long, has a capacity of 150,000 million gallons. Twenty-one million cubic feet of masonry are employed in its construction. The dam commands an arid area of 834,000 acres of which 202,000 will be irrigated annually yielding a crop of an estimated increased value of over £2,400,000. The project has taken fifteen years to complete and marks the fifteen years to complete and marks the finish of the gigantic irrigation scheme in the Deccan recommended by the commission convened by the late Lord Curzon when Viceroy of India.

P.4,000,000 PAMPANGA RIVER PROJECT, P.I.—Bids were opened at the bureau of public works, Manila, on October 30, for the construction of the Pampanga river irrigation system in Nueva Ecija, the second largest irrigation project in the islands which is estimated to cost approximately P.4,000,000.

Four bids were submitted namely, Carlos A. Barreto, Sotero Baluyot, provincial governor of Panepangs and contractor of the Peñaranda river irrigation system; Pedro Sochi, and F. T. Byan. A bond of P.40,000 were filed by each of the four contractors.

The work on these project consists in the excavation of the main canal measuring several hundreds of hectares and lateral excavations and also the construction of the protective dyke of Pampanga river irrigation system.

The project when completed will be capable of supplying water to 20,500 hectares of agricultural land which is now lying half barren, due to the poor supply of water. Five big municipalities of Nueva Ecija, including Cabantuan, Bongabong, Rizal, Talavera, and Aliaga, will be served by the project.

The building of the protective dyke can only be undertaken during dry weather because during the rainy season the water of the Pampanga river overflows its banks.